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VOLUME TWENTY-SIX
NUMBER SIX

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44/DEEP Down Under



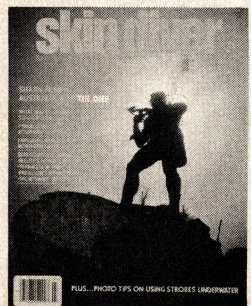
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80/Cayman Magic

cover

Atle Evans, of the Spanish Bay Reef Resort, stands in 90 ft. of water on a coral precipice overlooking Trinity Caves. He's the first Caymanian dive guide to become a YMCA instructor. Paul J. Tzimoulis took the photo with a Nikonos III, Oceanic 2001 strobe.

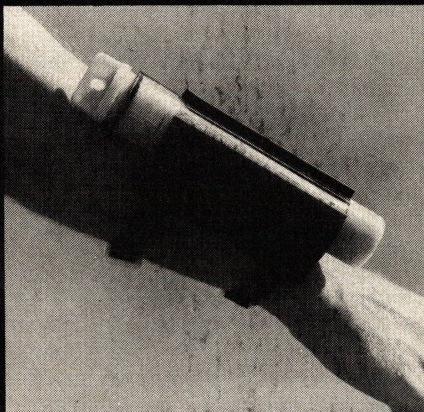


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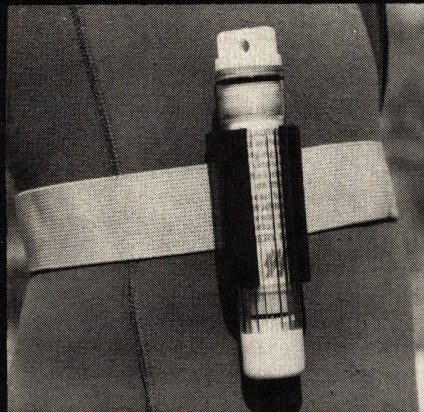
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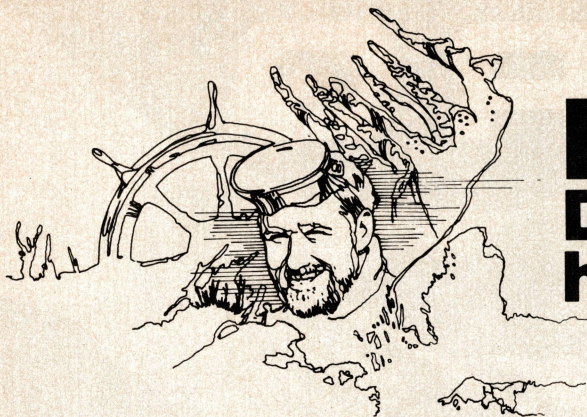
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Editorial

Don't knock it if you haven't tried it!

by the Publisher

The buoyancy compensator has become one of diving's most beneficial tools, and at the same time, one of this sport's most controversial topics. Old-time divers find it increasingly difficult to accept some of the "new fangled" designs, while new divers approach these innovations open-mindedly, eager to try the latest in equipment designs.

In the spirit of competition and free enterprise, many dive store dealers have taken sides, staunchly defending or attacking certain BC designs depending on which product lines they happen to sell. Scuba instructors, the guiding lights of our sport, have also become steadfastly divided on BC designs, training and usage. And in the midst of this chaos and turmoil, enters the new scuba student — totally bewildered by this controversy.

Take for example, the old time moss-back diver (circa 1960) who started his diving career with a CO₂ vest. For him, it is difficult to conceive any genuine advantages of air powered buoyancy compensators over CO₂ vests. He learned to dive with a CO₂ vest, and has survived many years of diving with it. He is proud of his old device and sees no reason to change. It is his badge of honor.

He regards the new BC designs with disdain, and is convinced that dive stores and manufacturers are over-engineering and over-pricing today's scuba gear. In truth, he has become a dinosaur in his own time — a relic of an era past.

Then we have the concerned instructor (circa 1965) who is convinced the manufacturers have gone berserk and are producing dangerous equipment designs. While he accepts the basic concept of BC vests, he thinks back-mounted BC's are killers — even though accident statistics don't bear out his theory.

His basic argument is that back-mounted BC's float an unconscious diver face down on the surface. Yet, he is at a loss for words when asked how many divers have actually died from this theoretical condition. Why would a diver suddenly go unconscious on the surface — and why wouldn't his buddy give assistance if he did pass out?

The truth of the matter is, that the position of the diver's head while floating on

the surface has relatively little impact on the safe function of the back-mounted BC design or on the safety of the diver using it. Scuba divers simply don't die in this fashion. With over 50,000 back-mounted BC's in use today, there has been no significant increase in the scuba diving accident statistics. Back-mounted BC designs appear to be just as safe as BC vests or other types of personal flotation equipment. The evidence favoring this conclusion is now so strong that every major dive equipment manufacturer in the U.S. is producing and distributing some type of back-mounted BC.

Another favorite objection is that back-mounted BC's are capable of tremendous lift (up to 60 pounds), thus a high rapid rate of ascent from depth, and should therefore be classified as advanced equipment. According to this line of reasoning, students should be taught basic scuba with a CO₂ vest, and then change to BC's during advanced training. Doesn't make sense, does it? Why should a student be taught to use a piece of equipment when he never intends buying or using it?

If we were to extend this line of reasoning a bit further, it would be logical to assume that every basic student should learn to dive with a two hose regulator in the basic class, and move on to single hose regulators in his advance training sessions. Sounds preposterous, doesn't it? The fact of the matter is that back-mounted BC's are no more advanced in their function or use than the traditional horse-collar designs. A compressed air-powered BC is a BC — regardless of whether it is worn around the neck or mounted on the tank pack. The function is the same and the lift capability is equally effective. Basic students can be trained just as easily, and just as safely, on a back-mounted BC as on any other flotation device. The key to safety is *initial* training — not *additional* training. Our problem lies not with the new student, but instead with the old-time diver who was originally trained on a CO₂ vest and now finds it difficult to make the transition. He needs BC training just as much as the neophyte student who is just learning how to breathe from a regulator.

Why the resistance to BC development? The sport of diving is beginning to experience a phenomenon known as future shock. Dive equipment technology and training are accelerating at an even faster pace.

For eight years (1960 to 1968), CO₂ vest designs changed very little. From '69 to '72, the changes were more significant. Today, BC designs are comparatively radical in both looks and function — with new designs every six months. The changes are greater and much more frequent — thus making some of the older divers and instructors a little dizzy. Things are moving too fast and they feel as though they are losing control.

Training methods and safety rules written as little as five years ago no longer apply. New equipment designs have made concepts which we formerly accepted as absolute law, obsolete. And, if you think today's BC designs are strange, watch what happens in the next five years. BC's are bound to become more sophisticated, more automated, and more expensive. The evolution will continue to accelerate.

How should this problem be handled? First of all, instructors and certified divers alike should realize that sport diving technology is still young and very rapidly evolving. The equipment we buy and use today is a vast improvement over gear made five years ago, but may very well be obsolete five years from now.

We must keep an open mind about new BC designs and be willing to evaluate them objectively. We must force ourselves to cast aside old prejudices and at least try new ideas. Some may turn out to be just gimmicks, but others will certainly become significant improvements over existing gear.

The only true way to evaluate new BC designs is to personally test dive the gear. It should not be a quick, cursory examination, but rather a series of five or six dives. It takes time and practice to really adjust. Until you are comfortable and completely at ease, it is impossible to make an objective evaluation. Don't be so quick to condemn a new design. There's a saying which goes, "Don't knock it if you haven't tried it." >

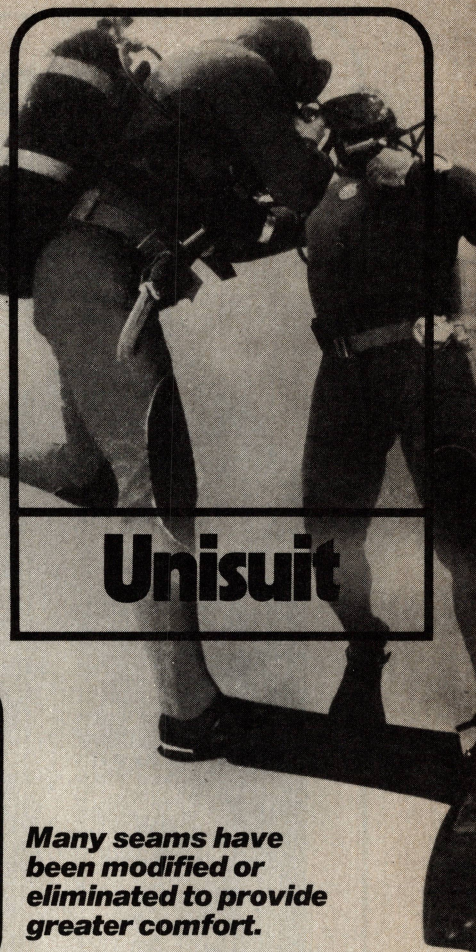
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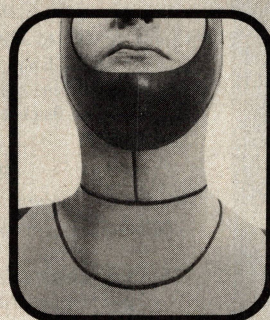
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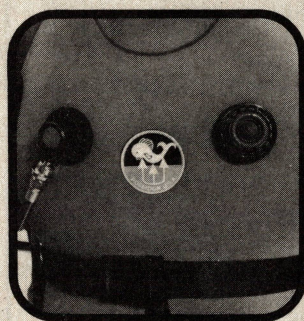
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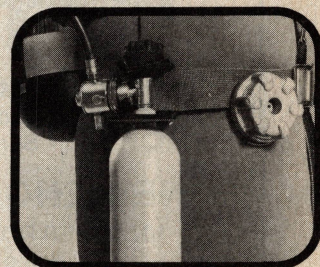
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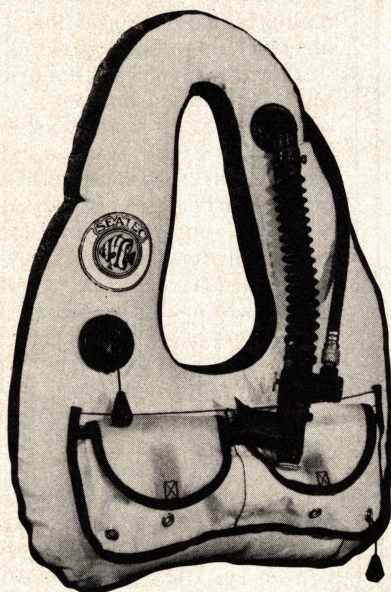


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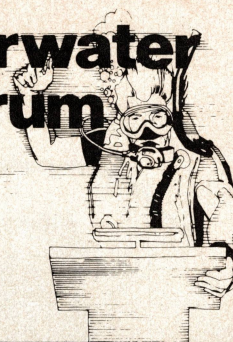
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Underwater Forum



Diver's Ear

I have been diving in the Pacific Ocean for 30 years. After about 15 years I started going to an ear specialist every six months for a "clean out." I never lost any hearing but began to take longer and longer to clear.

He explained to me about exostosis — the growth of bone on top of bone as a reaction to some outside stimulus. The most common and effective stimulus is cold water. A person's outer ears can actually grow shut with bone . . .

When my right ear was so overgrown that the doctor could barely get a thin wire through to the eardrum, and any amount of water or infection would close it for days, and the doctor told me it was irreversible and I would surely lose my hearing, I decided to do something about it. (I didn't have to consider giving up diving because he said that . . . would not reverse the bone growth.)

It turned out to be a major operation. My respect for the surgeon . . . is enormous — he sat for four hours and ground the bone away with a hand-held diamond drill, and had to drill within one millimeter of nerves which would have paralyzed portions of my face or destroyed my hearing if cut. Part had to be cut, folded back and then replaced.

I am writing this to inform other long-time divers of exostosis. You don't have to change your life-style, but see your ear doctor at least once every 30 years.

S. E. TOMASO PASADENA, CALIF.

Modify Your Gear

I just wanted to let you know I really appreciated the article in Feb. SDM, Modify Your Scuba Gear by Dennis Graver . . . These practical and helpful hints can really make diving easier . . . I also appreciate the Scuba Exams. The completeness of the answers . . . really is educational, too!

M. DANNER

LARGO, FLA.

Many thanks to Dennis Graver for his article, Modify Your Dive Gear . . . I was having problems with shifting weights on my weight belt and his easy trick really helped. Even greater help was the use of this same idea to stop my backpack straps from shifting and slipping . . . This

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is worthwhile reading for novice and "old timer."
R. AVIS DEERFIELD BEACH, FLA.

Diving Docs Addendum

I wish to add my name to the growing list of diving physicians.

I am a PADI certified diver and member of the Undersea Medical Society. I have certification as a Diving Medical Examiner via the course held in Bonaire, Nov. 1976. My specialties are Internal Medicine and Emergency Medicine.

RODNEY LARSEN, M.D.
7 Metacommet Street
Belchertown, Mass. 01007
(413) 323-5178

Divers Over 40

I note in the last issue an appeal for an "over-40's" diving club and would advise that such a club has existed here in Canada since 1971. It was organized by a group of business and professional people who, like your correspondent, found it a little wearing to rise at 4:00 a.m. for an early dive boat, dive all day and return to the B.C. mainland as the rays of the setting sun illuminated their exhausted faces.

Members of the club — "Old Men of the Sea" — have been involved in body recovery, research — medical and otherwise — and spend a fair amount of time supplying speakers and slide shows to service clubs and other groups on diving and conservation. As diving has become their primary hobby the diving scene is greatly enriched by their activities. . .

J.F. QUAIL VANCOUVER, B.C.

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After several seasons of ice diving with haphazard and thrown-together type diver tending equipment, we of the Sea Kings Diving Club decided to get together to design and build a permanent ice diving harness and tending system which would be versatile and safe. . .

I am pleased to report success in this endeavor. We can now put two divers through the ice quickly, easily, and safely and at the same time have the standby diver ready to enter the water if needed.

Any club that would like to prepare now for next season's ice diving is welcome to write me for a copy of our plans and a parts list, which we will provide free of charge in the interests of safety and brotherhood.

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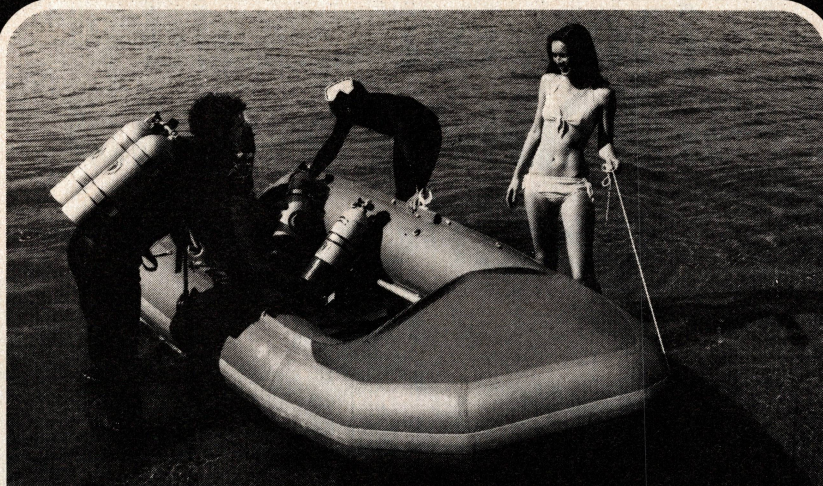
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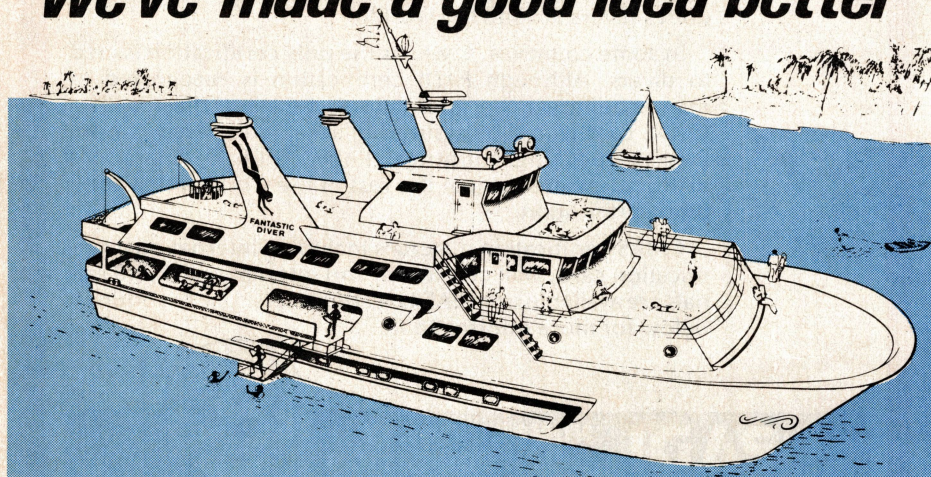
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Underwater Forum



Dive Medicine

On January 2nd, I had a collapsed lung. It was caused when a small cyst on my right lung burst.

The burst cyst was removed surgically along with two other smaller ones and the opening closed with stitches. The wall of my chest cavity was scraped and the top of my lung (where the cysts were removed) was pressed against the area so they would heal attached and therefore stronger. I was told the lung is now stronger than before.

On March 1st, I began playing tennis (about two hours at a time) and find I have no discomfort.

Would you please give me your advice regarding whether I should resume scuba diving? (I am certified and experienced) — and if so, any precautions I should take?

J.W. DREYER, JR. WHIPPANY, N.J.

Your operated lung won't collapse again, but the other might. Statistics indicate that roughly two percent of people who have a spontaneous pneumothorax will later have another involving the other lung. This incidence however could be higher for scuba divers, for swallowing or inadvertent breath-holding during ascent, or a mucus plug in a small airway, could subject their lungs to at least mild overpressure. Then too, pneumothorax occurrence at depth is far more serious than at the surface, because expansion of the trapped air during ascent collapses the lung further, and could even drive the mediastinum against the other lung, compressing it as well.

Should you decide to accept the risk and dive anyway, I suggest these precautions: stay shallow; avoid full chest expansion, especially during ascent; ascend slowly; don't dive within ten days of a chest cold; dive only where good emergency services are available, and have a reliable buddy.

C. V. BROWN, M.D.

SDM Medical Consultant

Toshiba Strobe

I was very interested to see the Church's article about the Toshiba TM 1 strobe which appeared in March SDM, as I recently purchased one...

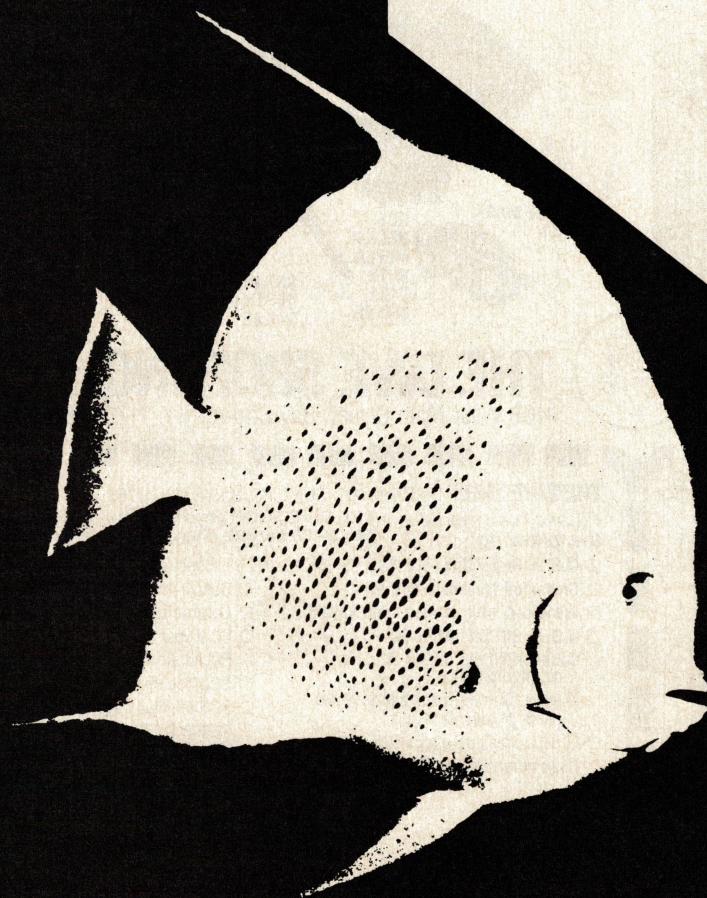
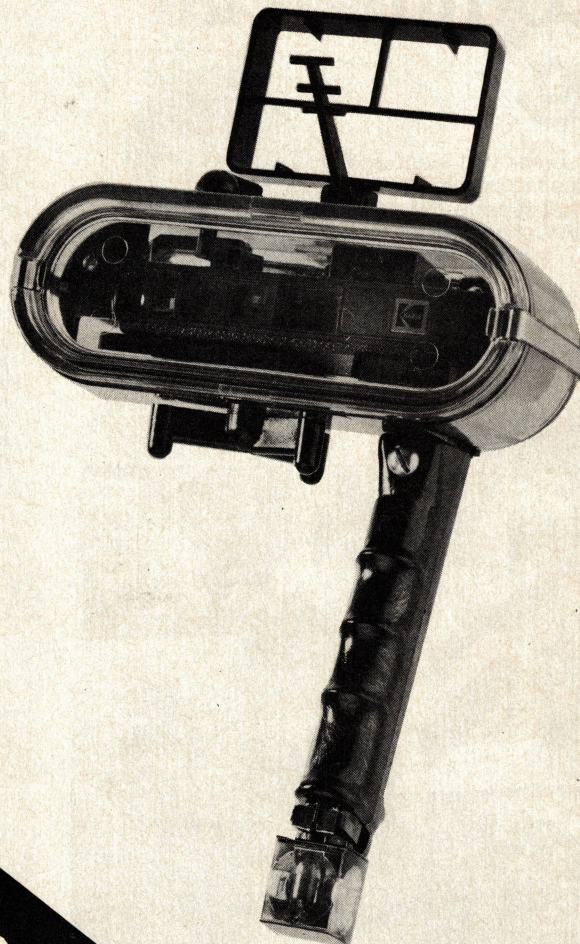
My solutions to two major design deficiencies of the strobe might be of in-

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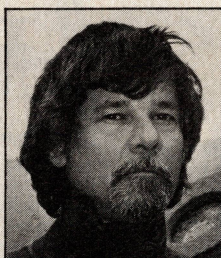
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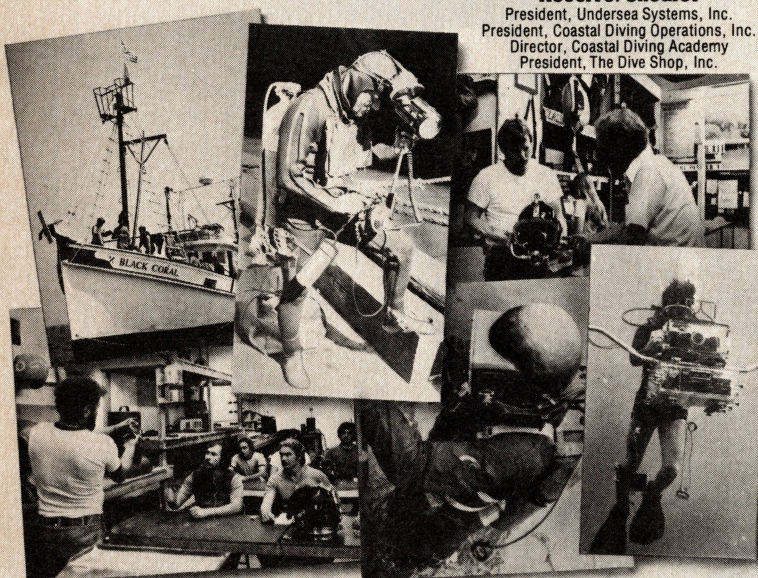
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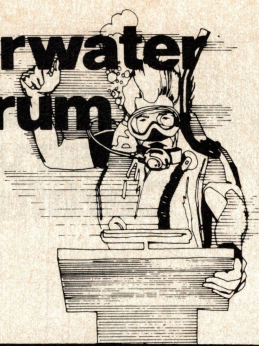
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Underwater Forum



terest to SDM readers. First, the Church's article mentions the difficulty in replacing the detachable arm in the baseplate bracket while underwater. I easily solved this problem by whittling a wooden plug out of three inches of broom handle. One end fits into the strobe arm and the other end is tapered to a point which then makes it easy to put back into the bracket hole.

The second problem in my opinion is the imbalance of the strobe when hand-held which is somewhat tiring to the hand. This is due to the batteries being located in the extreme rear of the case. This is solved by taping some lead weight to the lower front rim of the case, on the outside. I used lead solder strips held in place by duct tape. . .

MIKE MOONITZ

N.Y., N.Y.

Nubble Light Controversy

"As defendants contend, Plaintiffs need merely drive to another beach if they wish to scuba dive for free." With these words, a Maine Superior Court Judge ruled in favor of a town ordinance which effectively keeps divers from the popular Nubble Light [York, Me.] area . . . Since its inception, diving in Nubble Light has almost ceased.

Yes, you can buy a permit to dive at the Nubble, it will cost you \$25 and is only good during the weekdays, Monday through Friday. It cannot be used on Sat., Sun, and holidays. If you are an instructor, then you have the dubious pleasure of enriching the town treasury to the amount of \$150 for a permit with the same restrictions. In one and a half years, the town has sold less than ten permits.

Since Nubble Light has closed its doors to divers, another popular park in this area also decided that if the Nubble could make it stick, then they would do the same. Fortunately, this group listened to us and we were able to work it out. But we have no guarantee that this is permanent. They are also waiting the outcome of this legal action.

We have already filed an appeal to the State Supreme Court . . . We have no stake in this fight except a belief that we should be allowed to dive and enjoy it.

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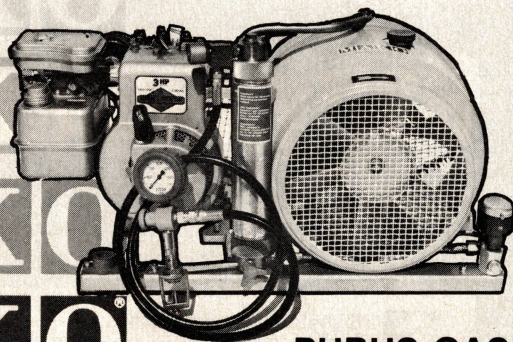
A black and white photograph showing a small, light-colored boat on a river. A person is lying face down in the water next to the boat. The riverbank is rocky and steep. The scene is captured from a high angle, looking down into the water.

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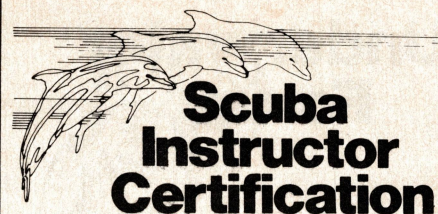


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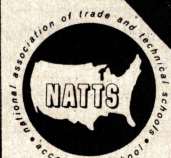
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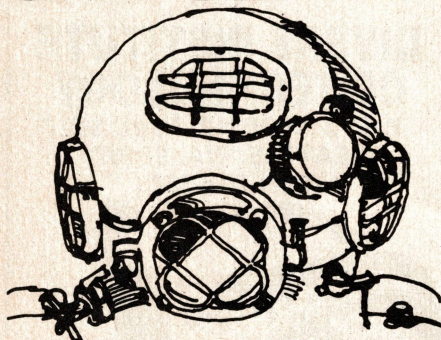
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PADI Instructor Training Course, San Diego, CA (Contact: Jim Williams, 273 D St., Chula Vista, CA 92010)

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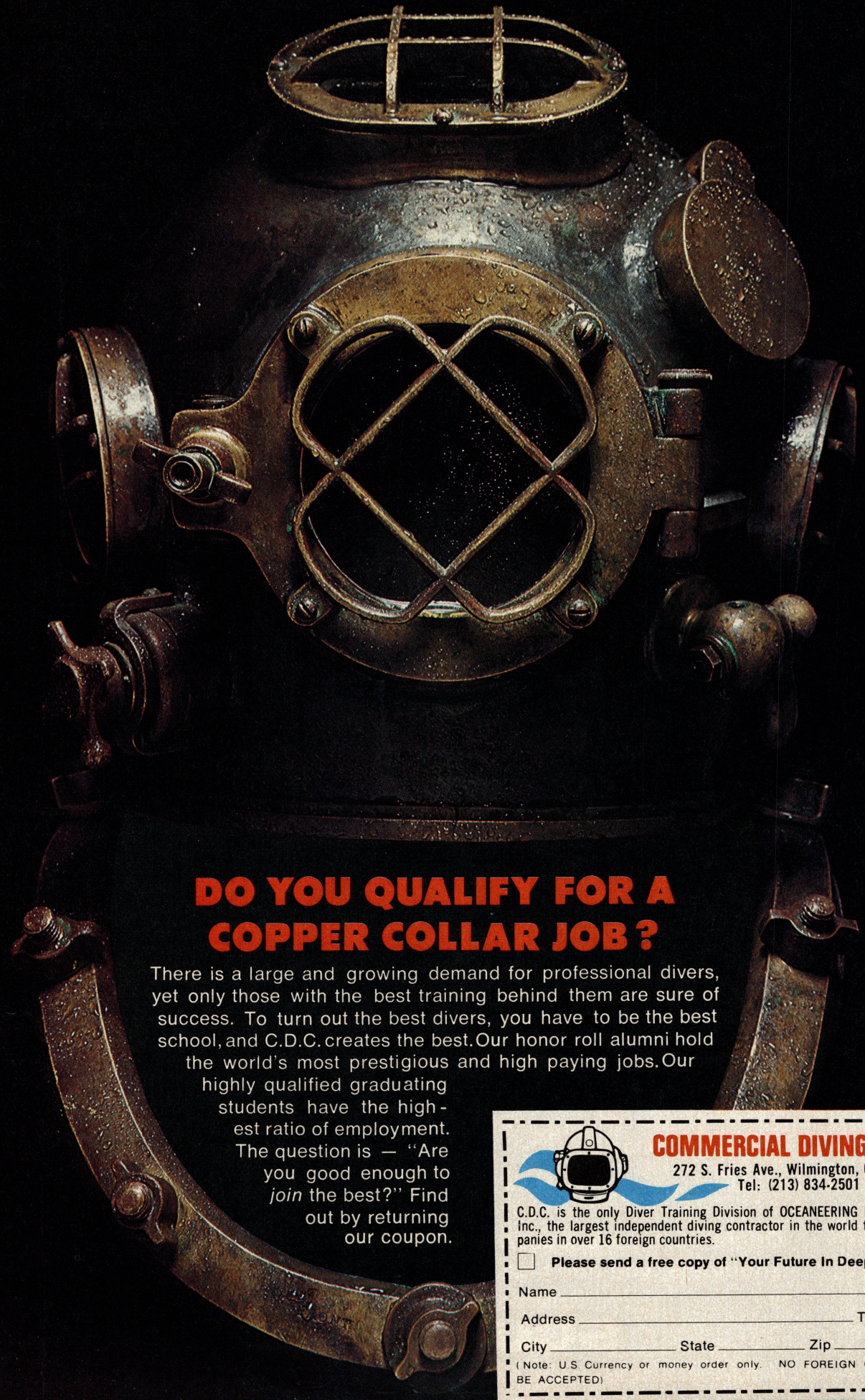
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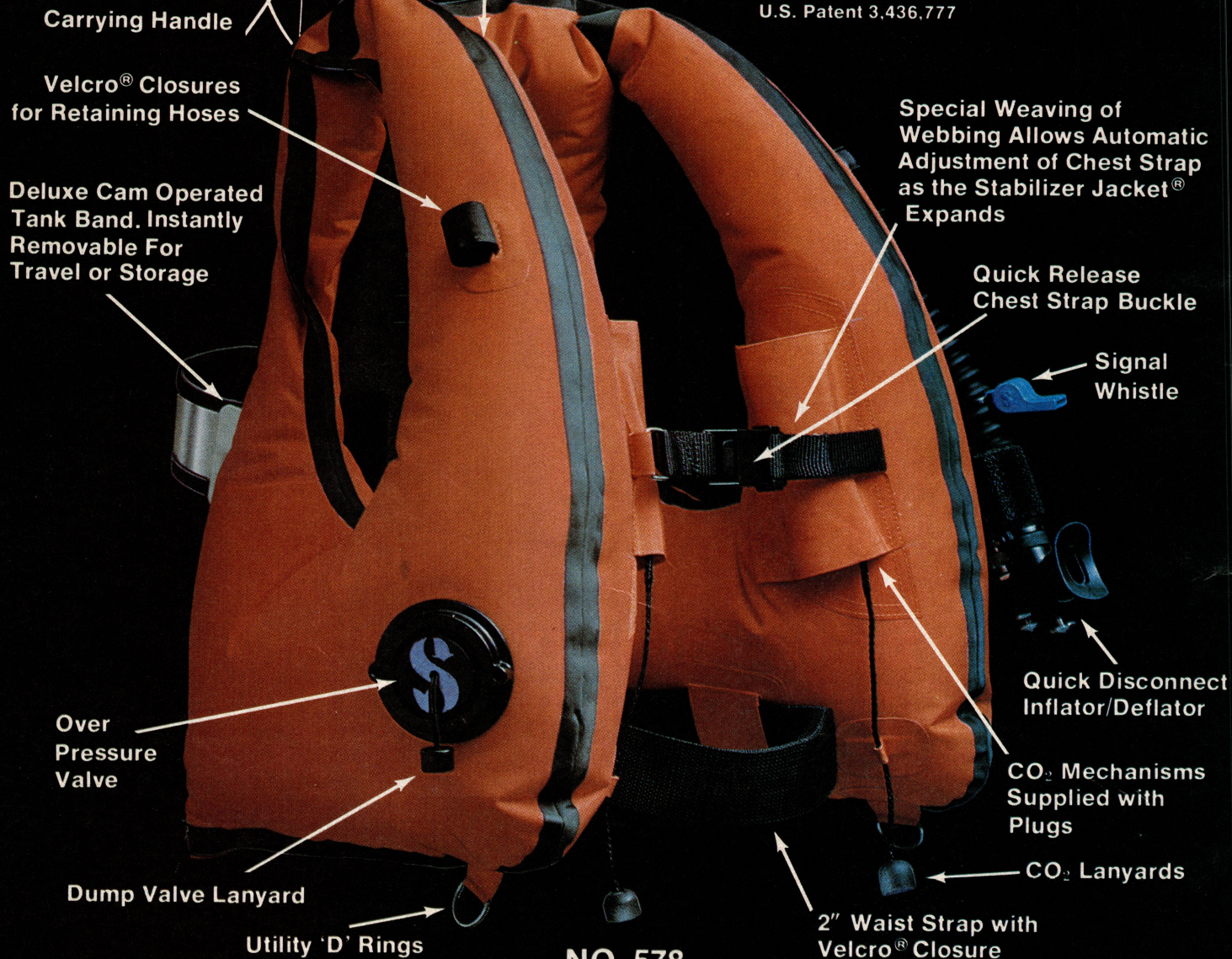
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SDM'S NATIONAL SCUBA EXAM

By Dennis Graver

Category: Medical Terminology

Medicine is prominent in the sport of diving. Numerous medical terms are encountered in articles, books, and presentations. The definitions of these terms are useful to divers. Test your knowledge by matching each list of terms to each list of definitions provided. Each definition is used but once. The precise medical definition may vary somewhat from those provided, as these have been phrased for understanding by the typical diver. Answers are on the following page.

List A: Anatomy

- | | |
|----------------|--|
| 1. Alveoli | A. Windpipe |
| 2. Bronchus | B. Lowest segment of the sternum |
| 3. Carotid | C. Subdivision of the windpipe |
| 4. Epiglottis | D. Protects larynx and trachea |
| 5. Eustachian | E. Membrane covering lungs and chest walls |
| 6. Larynx | F. Voice box above trachea |
| 7. Mediastinum | G. Chief artery to the head |
| 8. Pleura | H. Middle of the chest |
| 9. Pulmonary | I. Breastbone |
| 10. Sternum | J. Area between neck and abdomen |
| 11. Thorax | K. Internal organs of the body |
| 12. Trachea | L. Air cells in the lungs |
| 13. Tympanic | M. Pertaining to the lungs |
| 14. Viscera | N. Tube between throat and middle ear |
| 15. Xiphoid | O. Membrane forming the eardrum |

List B: Physiology

- | | |
|----------------------|--|
| 16. Anoxia | P. Respiration in excess of need |
| 17. Apnea | Q. Death of body tissues |
| 18. Asphyxia | R. Dizziness |
| 19. Bradycardia | S. Total lack of oxygen |
| 20. Diuresis | T. Difficult or labored breathing |
| 21. Dyspnea | U. Slowed heart rate |
| 22. Hypercapnia | V. Rapid, shallow breathing |
| 23. Hyperpnea | W. Suspension of breathing |
| 24. Hyperventilation | X. Excessive excretion of urine |
| 25. Hypoglycemia | Y. Insufficient oxygen in tissues |
| 26. Hypoxia | Z. Low blood sugar level |
| 27. Narcosis | AA. Excessive rapidity of heart rate |
| 28. Necrosis | BB. State of stupor or arrested activity |
| 29. Tachycardia | CC. Lack of oxygen and excess of CO ₂ |
| 30. Vertigo | DD. Excess CO ₂ in the blood |

List C: Maladies

- | | |
|-------------------|---|
| 31. Aerodontalgia | EE. Loss of blood from blood vessels |
| 32. Aerotitis | FF. Bluish discoloration of the skin |
| 33. Barotrauma | GG. Tooth pain due to gas pocket |
| 34. Ciguatera | HH. Fluid accumulation in tissues |
| 35. Convulsions | II. Low body core temperature |
| 36. Cyanosis | JJ. Fainting |
| 37. Dermatitis | KK. Ear squeeze |
| 38. Edema | LL. Blockage of arterial circulation |
| 39. Embolism | MM. Pressure related injury |
| 40. Emphysema | NN. Air in the pleural cavity |
| 41. Hemorrhage | OO. Under the skin |
| 42. Hypothermia | PP. Violent, uncontrolled contractions of muscles |
| 43. Pneumothorax | QQ. Fish poisoning |
| 44. Subcutaneous | RR. Inflammation of the skin |
| 45. Syncope | SS. Swelling produced by gas in any body tissue |

SDM'S NATIONAL SCUBA EXAM

List A: Anatomy

- | | |
|----------------|--|
| 1. Alveoli | L. Air cells in the lungs |
| 2. Bronchus | C. Subdivision of the windpipe |
| 3. Carotid | G. Chief artery to the head |
| 4. Epiglottis | D. Protects larynx and trachea |
| 5. Eustachian | N. Tube between throat and middle ear |
| 6. Larynx | F. Voice box above trachea |
| 7. Mediastinum | H. Middle of the chest |
| 8. Pleura | E. Membrane covering lungs and chest walls |
| 9. Pulmonary | M. Pertaining to the lungs |
| 10. Sternum | I. Breastbone |
| 11. Thorax | J. Area between neck and abdomen |
| 12. Trachea | A. Windpipe |
| 13. Tympanic | O. Membrane forming the eardrum |
| 14. Viscera | K. Internal organs of the body |
| 15. Xiphoid | B. Lowest segment of the sternum |

List B: Physiology

- | | |
|----------------------|--|
| 16. Anoxia | S. Total lack of oxygen |
| 17. Apnea | W. Suspension of breathing |
| 18. Asphyxia | CC. Lack of oxygen and excess of CO ₂ |
| 19. Bradycardia | U. Slowed heart rate |
| 20. Diuresis | X. Excessive excretion of urine |
| 21. Dyspnea | T. Difficult or labored breathing |
| 22. Hypercapnia | DD. Excess CO ₂ in the blood |
| 23. Hyperpnea | V. Rapid, shallow breathing |
| 24. Hyperventilation | P. Respiration in excess of need |
| 25. Hypoglycemia | Z. Low blood sugar level |
| 26. Hypoxia | Y. Insufficient oxygen in tissues |
| 27. Narcosis | BB. State of stupor or arrested activity |
| 28. Necrosis | Q. Death of body tissues |
| 29. Tachycardia | AA. Excessive rapidity of heart rate |
| 30. Vertigo | R. Dizziness |

List C: Maladies

- | | |
|-------------------|---|
| 31. Aerodontalgia | GG. Tooth pain due to gas pocket |
| 32. Aerotitis | KK. Ear squeeze |
| 33. Barotrauma | MM. Pressure related injury |
| 34. Ciguatera | QQ. Fish poisoning |
| 35. Convulsions | PP. Violent, uncontrolled contractions of muscles |
| 36. Cyanosis | FF. Bluish discoloration of the skin |
| 37. Dermatitis | RR. Inflammation of the skin |
| 38. Edema | HH. Fluid accumulation in tissues |
| 39. Embolism | LL. Blockage of arterial circulation |
| 40. Emphysema | SS. Swelling produced by gas in any body tissue |
| 41. Hemorrhage | EE. Loss of blood from blood vessels |
| 42. Hypothermia | II. Low body core temperature |
| 43. Pneumothorax | NN. Air in the pleural cavity |
| 44. Subcutaneous | OO. Under the skin |
| 45. Syncope | JJ. Fainting |

Date: APR 11 1977
In Reply Refer to: 343/272A-13

VETERANS ADMINISTRATION
REGIONAL OFFICE
211 MAIN STREET
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Mr. Al Mikalow, Director
Coastal School of Deep Sea Diving
320 29th Avenue
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Thank you for the time and assistance given our representative during the compliance survey in March. Your records showing attendance and progress were organized and complete. The back-up documents for the Fifty Percent Employment Survey showed that a great deal of time and money were spent in preparing the report. Your efforts were certainly rewarded when the survey showed such a high percentage of employed graduates.

A minor adjustment was made on the survey, because responses from students outside the two year period were counted. The overall result is 45 no responses were dropped, 19 more employed responses counted and the number of graduates employed becomes 90.4 percent.

We appreciate your assistance with the Veteran Education Benefits Program.

Thank you.

Charles R. Fikejs

CHARLES R. FIKEJS
Veterans Services Officer

cc:
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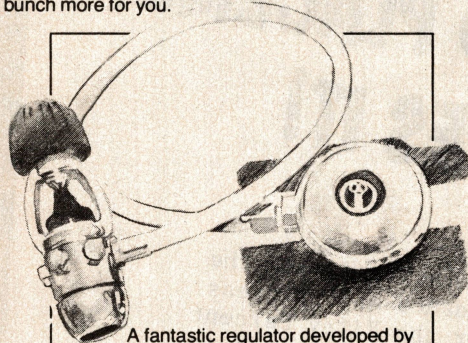


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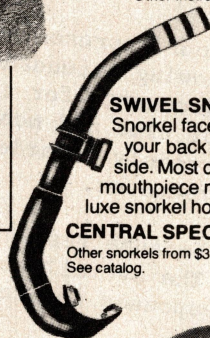
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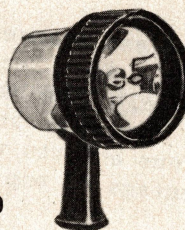


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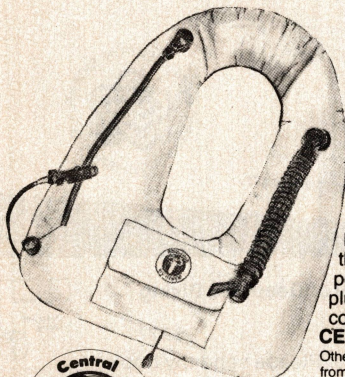
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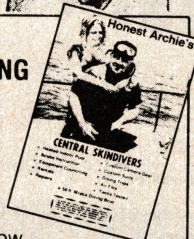
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Art Stanfield Dies

On May 3, 1977, the dive community lost one of its most respected members — Arthur L. Stanfield. He was, at age 53, the victim of cancer.



Stanfield's career in diving spanned more than 30 years. At 17 he joined the U.S. Navy and went on to become an UDT combat diver and instructor. During the Korean War he led many submarine-launched U/W teams deep into enemy waters for sabotage work.

In 1960, after 20 years service in the Navy, Stanfield joined AMF Voit as national sales manager for the Swimaster line of professional dive equipment. For the next 17 years, he traveled the world promoting Swimaster and diving.

Mexico Diving

The Mexican government has declared its intention of promoting sport fishing and diving in that country. The declaration was contained in a letter sent to Russell Thompson, president of the Underwater Society of America. In the letter, Licenciado Fernando Rafful, chief of the Department of Fishing, the controlling agency for all commercial and sport fishing in Mexican waters, promised to grant the necessary permits and said he has asked other authorities to do the same.

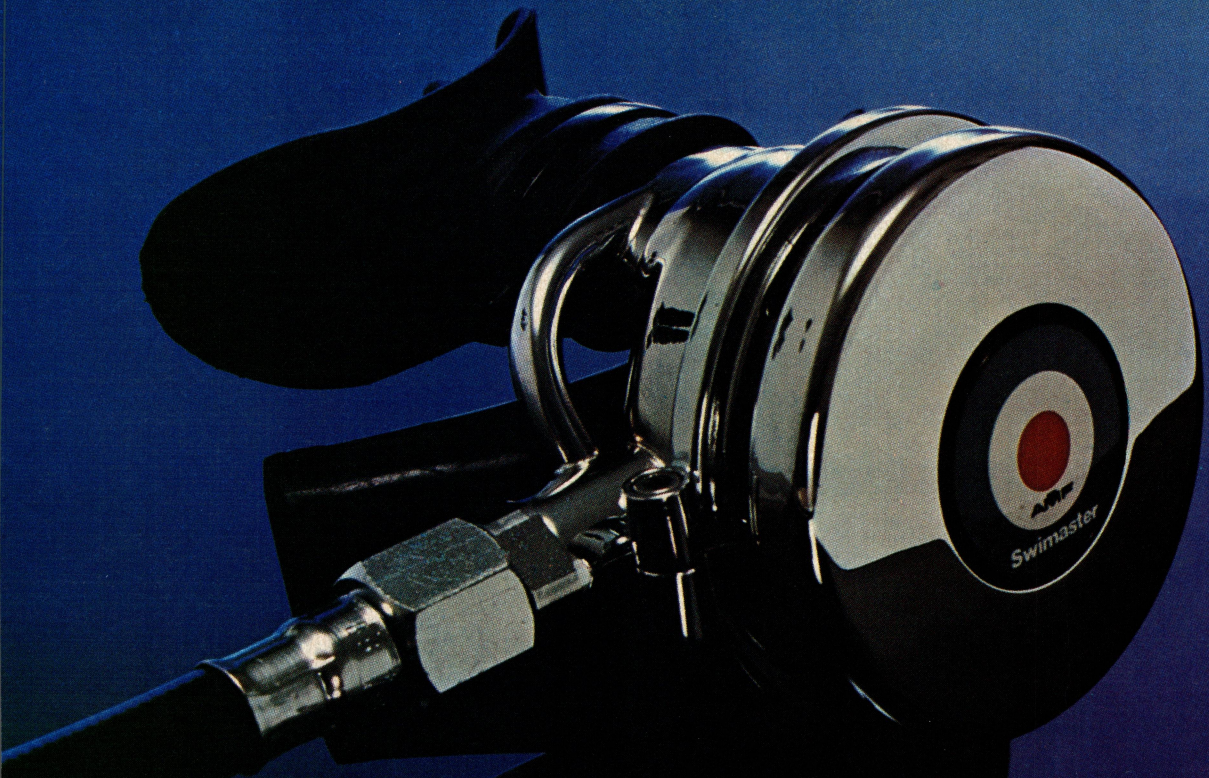
Rafful further explained that his department will assist the Mexican sport diving industry to provide better instruction and services for diving tourists, create meaningful programs at the several Mexican underwater parks, and identify places where boats, and boating services catering to divers, can be found.

In a related action, the San Diego office of the Mexican Dept. of Fishing has announced that permits will be issued for diving at the Coronado Islands. These have been closed to all diving for over three years. Spearfishing will be permitted, though no oysters, abalone, lobster, shrimp, turtle, Pismo clams, totuava or cabrilla may be taken and no form of coral may be picked. Spearguns must be the type powered by rubber bands.



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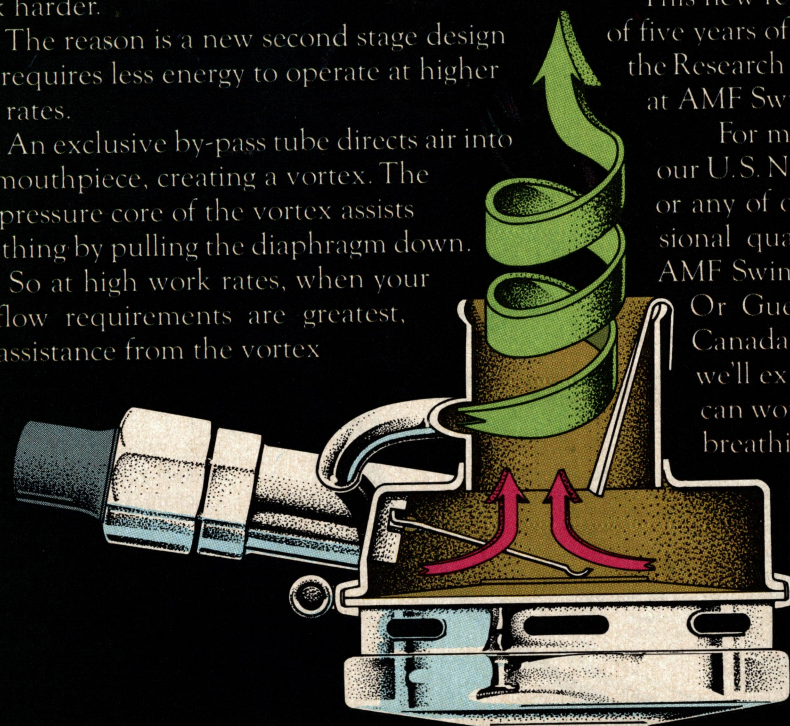
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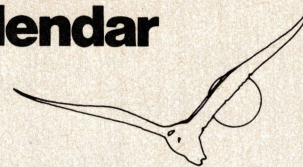


AMF Swimaster MR12-II

Patent Pending



Calendar



July 3

1977 CEDAM International Convention & Expeditions, Akumal, Quintana Roo, Mexico. (Contact: Akumal Reservations Services, 5820 Burning Tree, El Paso, Texas 79912)

July 18-23

3rd Annual U/W Festival, Miami, FL (Contact: Karlinne Wulf, Miami-Dade Public Library, Art & Music Dept., 1 Biscayne Blvd., Miami, FL 33132)

Sept. 3-5

Southwest Council of Skin Diving Clubs scuba nationals, Lake Amistad, Amistad Lodge, Del Rio, Texas (Contact: Ed Ralston, 3401 N. Meridian Court, Oklahoma City, OK 73122)

Sept. 3-5

Montana Dive Festival, Flathead Lake (Contact: Christy Elsenpeter, 618 Third Ave., Laurel, MT 59044)

Sept. 10-14 (opening program)

Downunder 77, 5th World Underwater Congress (CMAS), Brisbane, Australia (Contact: Bay Travel Inc., 2435 East Coast Hwy, Corona del Mar, CA 92625)

Sept. 15-26 (12 day cruise)

Downunder 77, CMAS cruise of Coral Sea (Contact: Bay Travel Inc., 2435 East Coast Hwy, Corona del Mar, CA 92625)

Sept. 16-17

13th Annual U/W Film Festival, San Diego Civic Theatre, 8 p.m. (Contact: Frank Trousdale, % San Diego U/W Photographic Society, P.O. Box 82782, San Diego, CA 92138)

Sept. 17

NAUI Underwater Film Review, John Hancock Hall, Boston, MA (Contact: Fred Calhoun, PO Box 291, Back Bay Annex, Boston, MA 02117)

Sept. 23-25

DiveMark 77, 3rd Annual Scuba Instructors Convention, Rockport, MA (Contact: John Burrage, 29 Hull St., Beverly, MA 01915)

Sept. 29-Oct. 2

IQ9, Miami Beach, FL (Contact: NAUI Hdqrs, 22809 Barton Rd., Grand Terrace (Colton), CA 92324)

Sept. 30-Oct 2

2nd Annual Great Lakes Dive-In, Playboy Club, Lake Geneva, WI (Contact: Bill Nuvotny, Aqua Center, 717 Morton Ave., Aurora, IL)

November 5

6th Inward to the Sea Int'l U/W Show, Lisner Auditorium, George Washington Univ., Washington, DC (Contact: Inward to the Sea, PO Box 41010, Washington, DC 20014. Phone (202) 347-0206)

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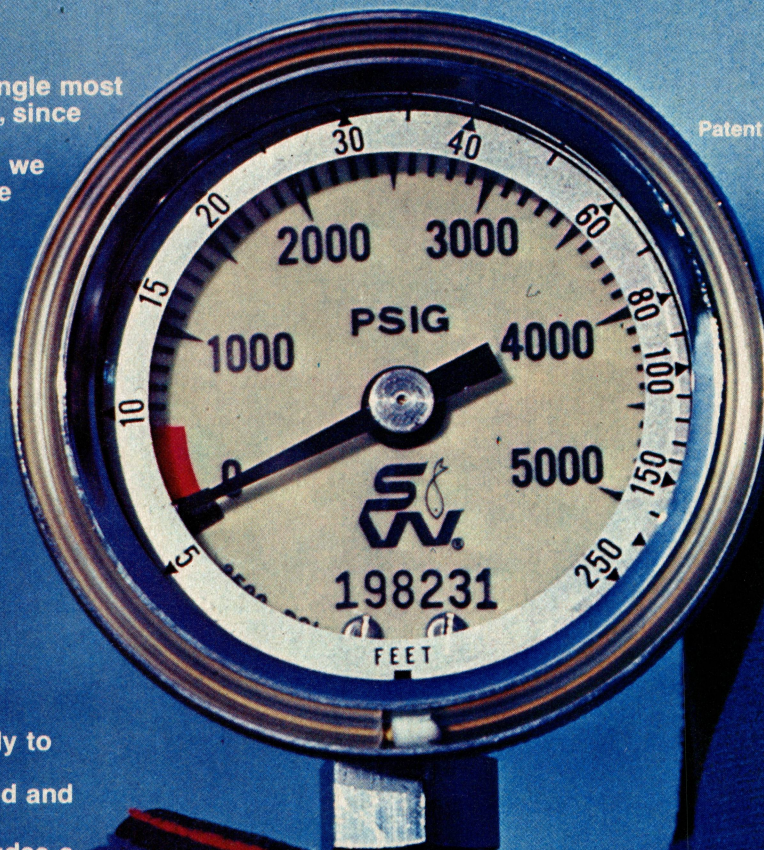
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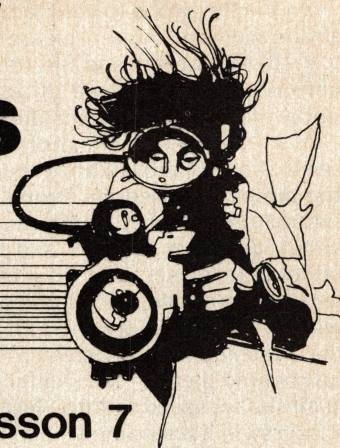
Patent No. 3,528,290

Sportsways: The Innovators

U/W Photography In 12 Easy Lessons



Using U/W Strobe Equipment



By Jim and Cathy Church

Lesson 7

The purpose of this lesson is to get you started with the practical aspects of using U/W strobe equipment. We will assume that you have a standard lens, such as the 35mm lens with a Nikonos or a 50mm lens with a housed camera. We will cover the use of strobes with wide-angle and close-up lenses in a future article.

FORMING THE CAPACITOR

If your strobe is new or hasn't been used for several months, the capacitor will have temporarily lost some of its ability to accept and hold an electrical charge. In practical terms, this means that it may not deliver full power for the first several flashes, may take longer than normal to recycle, or may not give the rated number of flashes for a fresh or fully charged battery. The capacitor is "formed" when it is fully charged by the battery for the first few flashes, but this forming process places a heavier than normal electrical drain on the battery.

With strobes powered by disposable batteries, use a set of old batteries to form the capacitor before the strobe is used. Insert these into the strobe and let it idle in the on position for about fifteen minutes. Flash the strobe a couple of times, and then let it idle for another five minutes. Without flashing the strobe, remove the old batteries and insert the new ones. The strobe is now ready for use. If you use old batteries to bear the brunt of forming the capacitor each time the strobe is prepared for use, the new ones will last significantly longer.

With strobes powered by rechargeable ni-cad batteries, be sure to read the owner's manual carefully as the instructions will differ. Sometimes the capacitor is formed automatically when the battery is being charged, sometimes the capacitor is formed by turning the strobe to the AC (household outlet) mode of operation, and sometimes there is no clear-cut statement of how to form the capacitor. If no method is given, you can let the strobe idle in the on position for several minutes after each recharging. Flash the strobe a few times, but turn it off with the ready light still glowing.

If your strobe has not been used or recharged for several months, try this to condition both the battery and capacitor:

1. Charge the battery for the specified number of hours.
2. Turn the strobe on and let it idle for two hours, and then turn it off with the ready light still glowing. Note: If the strobe has a blinking ready light, turn it off if the light stops blinking. If it is a non-blinking ready light, turn the strobe off if the light goes out or becomes dimmer.
3. Charge the battery again for the recommended time period, but stop if the battery feels warm to the touch.

NI-CADS REMEMBER

Ni-cads can remember a repeated charging and discharging pattern. For example, suppose you have a ni-cad battery that is supposed to power 80 flashes from a five-hour charge. In use,

however, you have set up a pattern of exposing 36 shots and then giving the battery a short charge of two or three hours. Then, you break the pattern and try to expose two cassettes of 36 exposure film. Halfway through your second cassette, the battery dies.

The problem is that the ni-cad battery remembers that it is only supposed to power 36 flashes — the number of flashes it powered each time in the past. At about 40 flashes, the voltage drops prematurely. This drop in voltage leads to a longer recycle time which is your tipoff that the battery needs to be recharged. Your problem is how to break the remembered pattern. One suggested procedure is:

1. Beginning with a depleted battery, give it a full charge — about 10 or 20 percent longer than the normal charge time, but heed any warning in the owner's manual about overcharging.
2. Flash the strobe at 30 second intervals until the recycle time lengthens to 30 seconds. Don't flash the strobe rapidly because heat build-up can damage electronic components.
3. Give the battery another full charge.

This should do the job. If not, repeat the above procedure. In random use — with mixed long and short charges, and with the battery being used to power varied numbers of flashes between charges — the ni-cad battery shouldn't develop a memory problem. The memory is based on a repeated pattern. If you wish to recharge after each 36 exposure cassette, let the strobe idle in the on position for an hour before recharging. This not only helps keep the capacitor formed, but also helps keep the battery from remembering that 36 flashes is all that it has to power. Also, avoid repeated short charge times.

CLEAN THE BATTERY CONTACTS

Invisible oxides can build up on the battery terminals and the contacts inside a battery compartment. These oxides can impede the flow of electrical current from the batteries. Clean the ends of removable battery cells with a rough cloth. A rubber pencil eraser can be used to clean the contacts inside of a small battery compartment. With the 300 volt and 510 volt batteries for the Subsea Mark 100 and Mark 150, do not touch the battery terminals as you can get a severe shock. The contacts between these batteries and the strobe are automatically cleaned by friction when the batteries are pressed into place.

CHECK THE SYNCHRONIZATION

Proper synchronization means that the focal plane shutter of your Nikonos or other 35mm camera has completely uncovered the film at the exact moment the strobe flashes. You can easily check your synchronization with the white paper test:

1. Place a piece of paper underneath the film pressure plate.
2. Connect the strobe sync cord to the camera, set the shutter speed for 1/60 second and remove the lens assembly.

3. Aim the strobe toward the shutter curtains and trigger the strobe with the shutter release.

4. If the strobe and shutter curtains are properly synchronized, you will see all of the paper at the film plane uncovered by the curtains during the flash from the strobe.

At shutter speed settings of 1/125 second or faster, you will see that one of the Nikonos shutter curtains is partially covering the paper when the strobe flashes. Higher shutter speed settings are achieved by the time interval between the curtain which uncovers the film, and the curtain which recovers it, rather than the speed at which the curtains travel. Thus, most focal-plane shutters don't operate fast enough to synchronize with the brief burst of light from a strobe. With cameras having the shutter up front — between the glass elements of the lens or just behind them — the shutter will synchronize with strobes at all shutter speed settings. Just make sure that the synchronization switch on the camera is set for X sync. To visually check the synchronization, open the camera back and look inside as you aim the camera toward a far wall. Flash the strobe by triggering the camera shutter and you will see the flash of light through the lens when the shutter opens.

ASSEMBLE CAREFULLY

Assemble your camera/strobe system carefully — double check each detail. The following list can be modified to fit your equipment:

1. Make sure batteries are fresh or sufficiently charged. Replace the charger cap with rechargeable submersible strobes.
2. Form the capacitor with old batteries if you use disposable batteries.
3. Clean and lubricate O-rings of strobe and housings.
4. Tape the PC cords in place with housed cameras or strobes.
5. Check the operation of off/on and power selection switch — check tightness of screws which hold handles to shafts.
6. Test flash the strobe with the camera shutter before loading camera. Use white paper for a synchronization test.
7. Be sure that all arms, brackets and other fittings are functioning, and check all screws, bolts and adjustments for proper tension.
8. If the final assembly will be done at the dive site, make sure that you have all the screws, bolts, nuts and hand tools that will be needed.
9. Load with film — you can use the first frame of film rather than white paper for a last-minute synchronization test.
10. Turn the strobe off after the final test flash.

While the exact steps, and the order of the steps, may need to be modified for your particular equipment, this section of assembling carefully may well be the most important part of this lesson. We have seen many photo dives ruined because the U/W photographer lacked one small allen wrench, charger cap or screwdriver. We've known others who have flooded their strobes because of pinched O-rings or PC cords, and forgotten charger caps. One friend exposed ten cassettes of 36 exposure color slide film during an expensive dive trip, but it was all ruined because his shutter and strobe weren't synchronized. Remember: assemble your system carefully!

MAKING AN EXPOSURE TABLE

Before taking a new strobe on an expensive dive vacation, you should make a table of estimated exposure settings for the strobe-to-subject distances you will be using. And, if the strobe manufacturer provided an exposure table, you should check its accuracy. While you may prefer to experiment in open water, you can use a swimming pool if you wish. If you use the pool, make the test exposures during late afternoon or early evening hours so sunlight won't overpower your strobe. The procedure is as follows:

1. Load with a 20 exposure cassette of color slide film.
2. Have your subject wear clothing with both bright and

dark colors, and have the subject's hands or other bare flesh in the picture area.

3. Take a series of bracketed exposures at apparent distances of 3, 4, 5 and 6 feet (the exact minimum distance will vary with different lenses). Use a cord with knots at 16 inch intervals to measure the apparent feet. Have an assistant to keep a written log of your test exposures and distances.

4. Have the slides processed and write the aperture and distance combinations on the slide mounts.

5. Project the slides. Choose those with the best exposures and make a table of the distances and apertures which gave you the best results. This table can be written with a ballpoint pen on masking tape stuck to the side of your strobe or camera housing for U/W reference.

THINK "GAD"

Some U/W photographers prefer to work with guide number systems. A guide number (G) is simply the product of aperture (A) times strobe-to-subject distance (D). In other words: $G = A \times D$. To remember this equation, think "GAD."

Guide numbers can be used to estimate either the aperture or the strobe-to-subject distance. Let's see examples of each:

1. Assume that your U/W guide number is 30, and that your subject is three apparent feet away. Divide the guide number of 30 by the distance of 3 to find the estimated aperture of f11.

2. Or, assume that you wished to expose at f16. By dividing the aperture of 16 into the guide number of 30, you find that the strobe should be held about two apparent feet away.

Great, but how do you find the U/W guide number? Let's look at two methods:

1. Going back to the exposure table discussed in the last section, simply multiply the aperture used times the strobe-to-subject distance.

2. If you have an above water guide number, you can reduce it to an U/W guide number for apparent distances by dividing it by a conversion factor. For bright, reflective subjects in clear water, try dividing by a factor of 3; for average subjects in moderately clear water, divide by 4; and for dark subjects in turbid water, divide by 5. These factors will give you apertures which should be within one stop of the desired exposure.

USING EXPOSURE GUIDES

Exposure tables and guide number systems often only provide a starting point for estimating the correct aperture. Such factors as water clarity, subject reflectance and the amount of sunlight available must also be considered. Calculations can get you started, but experience will be your best teacher.

TROPICAL WATER EXPOSURES

In bright, tropical waters, begin with an exposure meter reading whenever you are photographing subjects that are about three apparent feet or further away. At these distances, the sunlight will often overpower your strobe and will determine the exposure setting required. As a general rule of thumb: Compare your exposure meter reading to the aperture indicated by your strobe exposure table. If the meter and table give different apertures, choose the highest-numbered aperture of the two.

For example, if your exposure meter reading is f8, and your strobe table indicates f5.6, the sunlight has overpowered the strobe and requires the smaller aperture of f8. If you opened up to the f5.6 indicated by the strobe exposure table, you would overexpose by a full stop.

If you have a strobe with adjustable power settings, and become confused while underwater, simply turn your strobe to its lowest power setting and use your exposure meter to determine the aperture.

TURBID WATER EXPOSURES

In turbid water, the sunlight will probably not overpower your strobe, so you usually won't need an exposure meter.

Rather, you will be using your exposure table most of the time. For best results, follow these simple rules:

1. Get as close as possible to your subject — don't expect to photograph details at distances greater than about one-fifth of the visibility.
2. Choose and expose for bright, reflective subjects. For diver portraits, expose for the face and bright articles of dive gear, and allow dark wet suits and dark backgrounds to go dark in your pictures.
3. Angle your light in from the side or from above to avoid the backscatter of light from suspended particles.

BRACKET-BRACKET-BRACKET

If you are heading for an extended dive vacation, and intend to shoot a couple of cassettes of film each day with that new, untested strobe, don't trust anybody's exposure charts, guide numbers or advice about exposure settings. Too many variables enter the picture — such as your ability to accurately estimate U/W distances, and aim the strobe correctly, and the condition of your strobe and exposure meter — which can cause problems.

In other words, if your buddy tells you ahead of time to use f8 at three feet, the correct exposure can vary from f5.6 to f11. Therefore, until you gain experience with your subjects, water conditions and equipment, we strongly suggest that you take three pictures of each subject. In the foregoing example, expose at f5.6, f8 and f11. Taking three exposures — over, under, at the estimated aperture — is called bracketing. Granted, only one-third of your pictures should be properly exposed, but this is much better than running the risk of having all of your pictures under- or overexposed. There are two methods of bracketing: you can vary the aperture as described above, or you can sometimes leave the aperture unchanged and bracket by moving the strobe closer to, or further from, the subject to change the light intensity.

Bracketing is the secret of many professionals. The pictures they publish are all properly exposed because they had many exposures to choose from.

USING ADJUSTABLE ARMS

Adjustable strobe arms, which allow you to place the strobe at different angles to the subject, are valuable tools for many U/W situations. With a housed SLR camera, you can adjust the strobe for the desired position, and then use your left hand to steady yourself on the bottom as you trigger the shutter release with your right hand. And, if you have a two-strobe system, at least one strobe should be mounted on an adjustable arm. For best results with an adjustable arm, follow these tips:

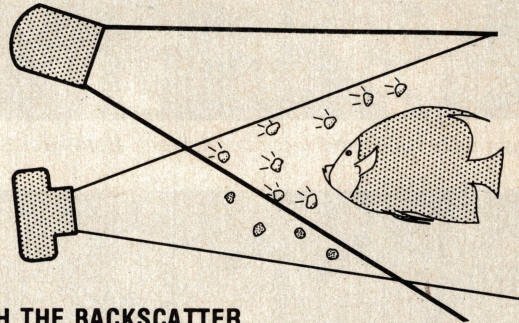
1. Once you have positioned the strobe for a given camera-to-subject distance, don't forget to reposition the strobe when the camera-to-subject distance is reduced or increased. It is easy to forget when you are concentrating on your subject and exposure setting.
2. With large strobes, or loose adjustments in the arm, the strobe can creep to a different position if you aren't watchful.
3. If you preset focus and strobe position for a camera-to-subject distance in air before going into the water, be sure to angle the strobe so it is aimed at the subject's actual U/W distance which will be one-third further away than the apparent distance the lens is focused for.

HANDHOLDING THE STROBE

Handholding the strobe arm may be necessary in some situations, especially when you are working with moving subjects. You can place the strobe exactly where you want it without having to tighten or loosen any fittings. However, be sure that the strobe arm is easily attached or detached from the camera or camera housing.

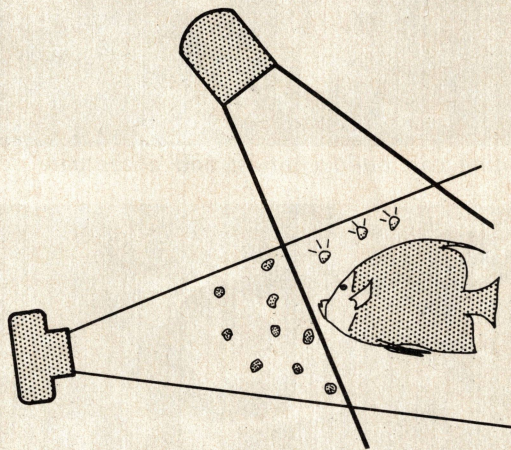
The subject's apparent and actual positions can cause a problem when you are handholding the strobe. When your eye is viewing the subject through the camera viewfinder, and

your hand is aiming the strobe by feel, your hand-eye coordination automatically aims the strobe at the image that you see. However, because of refraction, the fish that appears to be three feet away is really four feet away. The problem is that you are aiming the strobe at the subject's apparent position — the actual position being one-third further away. Therefore, the beam of light from the strobe can pass between the subject and your camera. You end up with a lot of illuminated particles between you and your underexposed subject. Remember: Whenever you aim the strobe with hand-eye coordination, aim at a point that is one-third further away.



WATCH THE BACKSCATTER

If you frequently have little bright spots in your pictures, you have a problem with backscatter. The light from your strobe is striking suspended particles in the water and is reflecting back to your camera lens. Sometimes you will see the particles



themselves, brightly illuminated, in the picture. Other times, their bright reflections reflect off the lens elements and show up as bright, hexagonal spots the shape of the opening of the iris diaphragm of the aperture control.

The closer the strobe is to the camera, the greater the problem with backscatter because the light reflected from suspended particles reflects back to the light source. To minimize the effects of scattering, move the strobe away from the camera and direct the strobe light to the subject at an angle of about 45 degrees. Your subject will be illuminated, but the backscatter from suspended particles will not be reflecting directly toward the camera lens.

WORK THE ANGLES

Practice working with different strobe angles. Select a stationary subject — such as group of tube sponges, an anemone or a coral head — and take a series of photographs with the strobe light directed from in front, beside, above and behind the subject. Study the resulting slides carefully to see the effects of these different lighting techniques. You will see that the front lighting often produces flat pictures and more backscatter. The side and top lighting can be used to build contrast and accentuate details, and the back lighting can be used to outline and separate subjects from backgrounds. Having good subjects and good strobe equipment is only half the

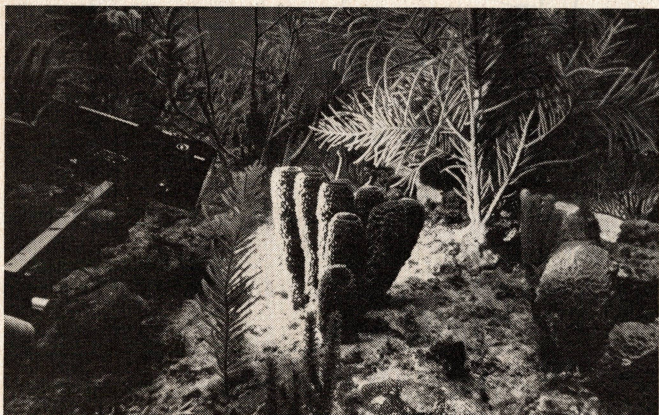


photography and drawings by Authors

Back lighting outlines and separates subjects from backgrounds.



Front lighting can produce flat pictures and more backscatter.



Side lighting can build contrast and accentuate details.



Top lighting can also build contrast and accentuate details.

battle — it takes good techniques to create good pictures. Practice working with the angles.

ADDING A SLAVE STROBE

Because multiple strobe lighting will be covered in greater detail in later lessons, let's just concentrate on one use of a slave strobe: the photographer at work picture which shows the photographer's strobe flashing.

First, let's make it clear that the photographer at work is modeling for you and is not taking pictures of his own. You pose the model and his slave strobe flashes when it detects the flash of light from your strobe. In most cases, direct your model to hold his strobe at an angle so its beam of light does not directly strike your camera lens and cause harsh reflections and overexposure. Rather, photograph your model's strobe from the side so its beam of light will be seen in your picture without excessive glare. If your model's strobe has multiple power settings, set it for a low power setting if it is to be held close to the model's implied subject. If the model's strobe has a single power setting, caution him not to hold his strobe too close to his subject as this could cause an overexposure.

UPDATING THE CHART

In the last lesson, we gave you a chart of the specifications of most of the submersible strobes on the market at that writing. Since we prepared that chart, we have received a Sea Research & Development Seastrobe K for evaluation. If you wish to update your chart, the specifications of the Seastrobe K are as follows: It has a built-in, ni-cad battery with a 14 hour charging time. It gives over 400 flashes at the 100 watt-second setting, and over 200 flashes at the 200 watt-second setting, with recycle times of 6 and 12 seconds respectively. The rated ASA 64 apertures for high and low power settings are f22 and f16 at three apparent feet. The U/W beam angle is 90° with a circular pattern. The Seastrobe K has both slave and sync modes, is supplied with a SeaLink connector, weighs 8.5 pounds in air and retails for \$595.

SUGGESTED ACTIVITIES

1. With an empty camera and strobe, practice aiming the strobe in a swimming pool. Handhold the strobe and aim it with hand-eye coordination alone. Watch to see if the light hits your intended target — such as the drain at the bottom, light at the side, or other simulated subject.
2. Make an exposure chart as described in this article.
3. If you have a record of past pictures with pleasing exposures at known distances, calculate an U/W guide number for the film and strobe used.
4. Using a single subject, illuminate it with strobe light from the front, sides, top and behind. Examine the resulting pictures to see the effects of these.

QUESTIONS AND ANSWERS

1. If you found that your best U/W exposures were taken at f8 with a strobe-to-subject distance of three apparent feet, what would your U/W guide number be?
 2. Given the exposure guide of f8 at three feet, and an exposure meter reading off the subject of f5.6, which of these apertures would you use?
 3. What conversion factor might you use to reduce an above water guide number to an U/W guide number for average to bright subjects in clear water?
- ANSWERS: (1) The U/W guide number would be 24. (2) Choose f8 because the strobe has overpowered the sunlight. (3) A conversion factor of 3.5 could be used.



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Equipment Orientation Course

Divers who have always wanted to try out different kinds of sophisticated dive equipment and various underwater communications systems will have a chance to do so during an Industrial Orientation Course August 12-21 by Commercial Diving Center. The lecture/lab course is split into three parts, held in three California locations: Wilmington, Catalina Island and La Jolla.

During the three days in Wilmington, students will get acquainted with commercial dive equipment, including hard hat rigs. On Catalina Island, students will work with recreational and scientific gear, including diver propulsion systems, advanced dive gear, and communication systems, including U/W TV. At Scripps Institute in La Jolla, divers will get a chance to work with underwater tools, hull-cleaners and other specialized equipment.

The course is sponsored by the staff of Commercial Diving Center. Actual use of the equipment is preceded by a lecture. Course lecturers include: Dr. Art Bachrach, Dr. Glen Egstrom, Leonard Greenstone, Jim Joiner, Tommy Tompson and Jim Stewart.

The requirements for the course are basic scuba certification, and medical approval, although some people go through the course as observers. The cost is approximately \$950, and includes room and board, and transportation during the course.

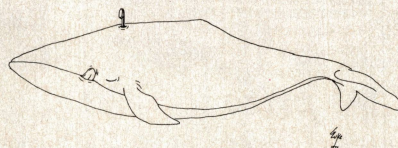
For more information contact: Leonard Greenstone, Director IOC, 6029 Venice, Los Angeles, Calif. ☎

Coastal Diving School, Oakland

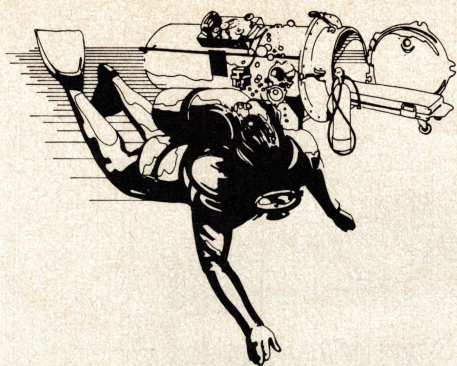
Coastal School of Deep Sea Diving, Oakland, Calif., has a 28 year record of training safety, with no major student accidents, according to the school's president, Alfred A. Mikalow.

This unmatched performance is the result of safety-conscious instructors who insist that students observe every possible safety precaution for themselves and their teammates.

Mikalow also noted the necessity to clear up the confusion between his school and a new East Coast school with a similar name. The East Coast school is not affiliated or connected with the Coastal School in Oakland. ☎



"It looks all clear, sir. He must have left!"



Medifacts The Bleeding Diver

By Charles V. Brown, M.D.

A clumsy fellow broke a glass doing the dishes, and the quarter-inch cut in his palm bled excessively in spite of firm wrapping. A train wheel lopped off another fellow's legs, and there was hardly any blood. This business of bleeding and its control is more complex than many folks imagine.

The Basis

An average man has about 12 pints of blood. His heart pumps it into his arteries at a pressure of 120 mm of mercury, more or less — much more, for example, in hypertension and much less in shock. Small vessel resistance reduces that pressure to about 20 mm in the capillary beds. In veins, the pressure is low but varies with posture because of gravitational effect. One-way valves prevent much transmission of venous pressure back to the capillaries. Most arteries interconnect with others, as do veins. Bleeding from cut arteries will be fast, pulsatile, and bright red. Capillaries ooze slowly, and veins discharge a steady low-pressure flow of darker blood. When loss is slow, other body fluids shift into the bloodstream to maintain a reasonable circulating volume, but the level of oxygen-carrying hemoglobin gradually falls. Rapid loss soon leads to shock, and then to death.

The body does have defenses. An artery can constrict when injured, the smaller ones being considerably better at this than the larger. Blood platelets are always trying to stick to anything they touch. The lining membrane of intact vessels secretes a chemical that scares them off, but injured vessels welcome sticky platelets to plug up leaks. Then the blood clotting mechanism, set off by adherent platelets and damaged tissue factors, kicks into high gear and tries to seal off the vessel. As blood volume shrinks, arterioles constrict selectively, sacrificing circulation to less critical areas such as skin and intestine in favor of the heart and brain. Veins constrict to

(Continued on Page 36)

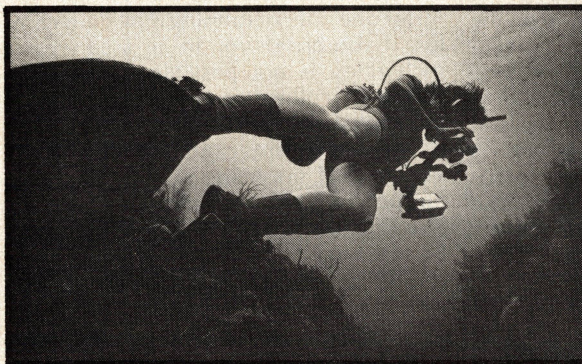


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DISCOVER

the do's & don'ts
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with
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SDM PRODUCT REVIEW

THE TEKNA- LITE

A pocket sized
pathfinder

By Paul J. Tzimoulis



Have you ever made a dive and discovered an inviting cave, only to remember that you did not bring along your underwater light? Do you recall the frustration of vainly attempting to peer into the dark shadows while mentally kicking yourself for leaving the light on the boat because it was just too bulky? It seems like underwater lights are just never around when you need them the most.

Unless the dive is a preplanned night excursion or cave exploration, the dive light is seldom part of a diver's normal equipment. Yet, there are many times when a diver would dearly appreciate having it at his disposal.

The TEKNA company has just introduced a new product which may solve this annoying problem and significantly change the sports diver's dress. TEKNA has developed an underwater light which is small enough to be carried on all dives, and yet bright enough to do the same job as many larger models. No bigger than a small ice cream cone (one scoop), this compact little light will fit into most any BC vest pocket or a wet suit utility pocket. It measures five inches long, 2½ inches in diameter, and weighs only 8¾ ounces. In saltwater, the TEKNA-LITE is one ounce positively buoyant and quickly floats to the surface if dropped or lost.

The design of the TEKNA-LITE is simplicity at its finest. There are no switches, no latches, no wires and few moving parts. Batteries can be changed in seconds and recharging is simple and easy.

The entire light assembly consists of four basic components. The case, which houses the batteries, is made of high impact injection molded ABS plastic. It is virtually indestructible and leak-proof. The front end of the case is threaded and grooved for an O-ring seal. The back end of the case has a molded eyelet and nylon wrist lanyard for easy carrying.

A modular power pack which fits into the case consists of four rechargeable AA nickel-cadmium batteries. These ni-cads are specially constructed General Electric industrial cells which are computer matched for perfect recharging and discharging rates. The four batteries are held in a plastic frame which is equipped with wireless male and female snaps that can be quickly plugged into either the bulb assembly or the recharger. The power pack takes 14 to 16 hours for a full charge and will provide enough electricity for one hour of running time underwater. If you are diving in an area where recharging is not possible, normal alkaline dry cell batteries (such as Mallory Duracells) can be substituted.

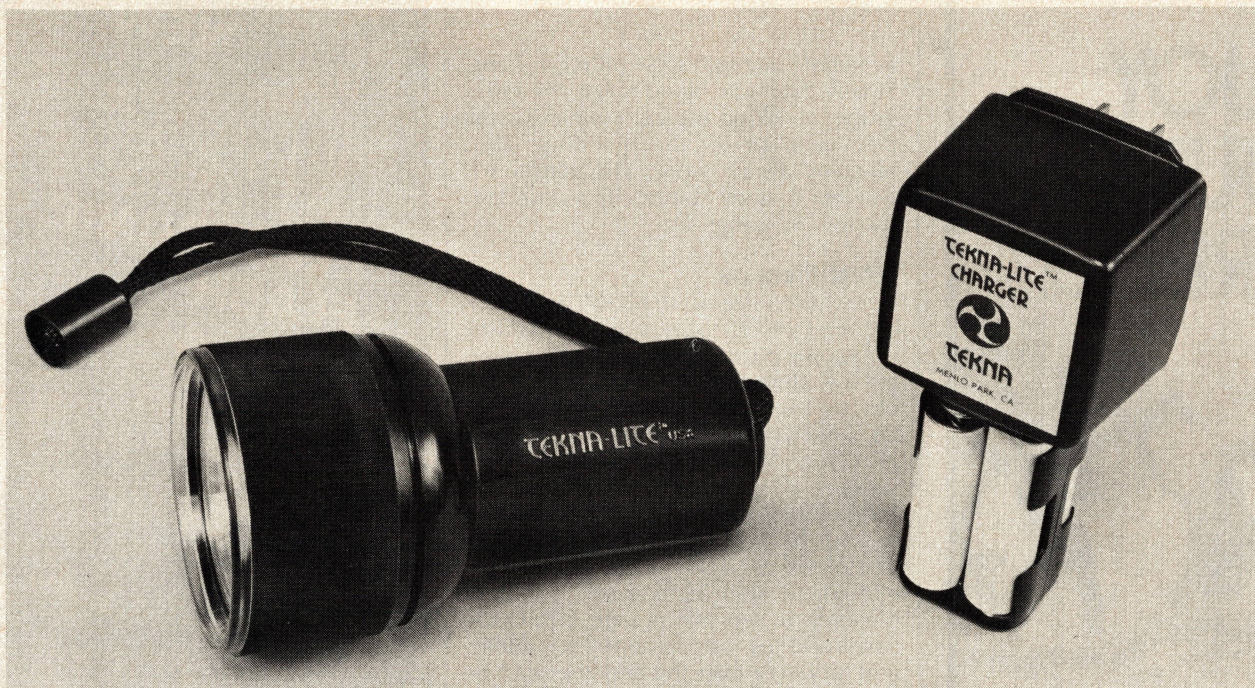
The front lens and bezel of the TEKNA-LITE are made of a highly durable polycarbonate plastic. The bezel is also threaded to match up with the case. By screwing the bezel onto the case, the spring-mounted bulb comes into contact with the power pack, and the light goes on. It can be turned off by simply unscrewing the bezel a quarter turn.

Inside the bezel is the bulb and a two-inch diameter reflector assembly. The re-

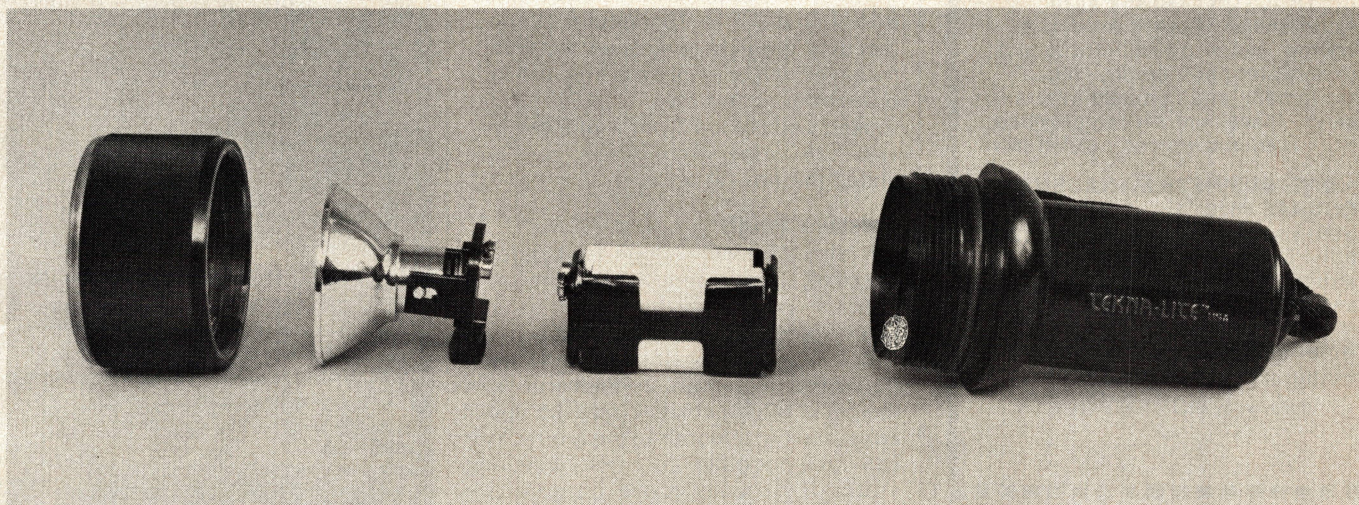
flector has a narrow beam angle of four degrees by four degrees for maximum lighting intensity. Centered in the reflector is a General Electric PR-13 bulb which has a total lifetime service of 15 hours. Two other bulbs can be substituted for the PR-13, depending on whether you desire brighter light output for a shorter service period or a longer lasting light bulb of lesser intensity. Information on the bulbs is included with the operating instructions for the TEKNA-LITE. Neither the bulb/reflector assembly or battery power pack contain any wires, so the chances of corrosion or wire breakage are reduced significantly.

In addition to the TEKNA-LITE's four basic components, a small battery recharger is packaged with it. It will plug into any standard 110-120 volt AC wall socket. The battery pack snaps into position easily and requires no special hookup. The positioning of the terminal snaps makes it virtually impossible to inadvertently reverse polarity.

I recently tested two TEKNA-LITES for a period of five days of open water diving during a visit to Grand Cayman Island. The lights were used on an average of three times a day, including two night dives, two wreck dives, and at least five cave exploration dives. The lights showed absolutely no signs of water leakage during the entire week of testing, and performed flawlessly when it came to switching on and off. They were pleasingly compact and lightweight. In fact, the units were hardly noticeable once



photography by Geri Murphy



they were tucked away in my pocket.

As far as light output is concerned, the TEKNA-LITE puts out a narrow but surprisingly bright beam. It penetrates the darkness just as far, or farther than many underwater lights of larger size and higher cost. Although the narrow beam angle does not illuminate as large a surface area, the beam performance is more than adequate for most sport diving requirements. Obviously, there is a trade-off in light output for compact size. The small battery package provides enough juice for one full tank dive (approximately 70 minutes). However, the trade-off is more than fair since the TEKNA-LITE is the kind of dive accessory

which becomes a valuable aid rather than a hindrance.

One more point well worth considering is the price. The TEKNA-LITE, battery pack and recharger is priced at \$29.95 — a value which is hard to beat. An extra battery power pack costs \$13.95 and extra bulbs are \$.50 a piece. If you plan to do a lot of night diving, wreck diving, or cave exploration, I would recommend obtaining at least one extra battery pack and three or four bulbs. You can be charging one battery pack even while using the light.

The next time you're in your local dive store, ask to see the new TEKNA-LITE. It's likely to be love at first sight! ➤

The TEKNA-LITE has few moving parts. It uses either nickel-cadmium or alkaline dry cell batteries. The ni-cads are easily recharged with the small recharger which plugs into any standard wall socket.

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Medifacts

(Continued from Page 33)

accommodate to the dwindling volume. Finally, the more blood is lost, the lower drops the blood pressure, which is the driving force for the bleeding. Thus bleeding always stops. The question is whether it stops before circulation falls too low to sustain life.

Direct Pressure

Any first aider worth his salt water will tell you right off, the way to stop bleeding is to apply direct pressure. That is sound advice, almost always. You jam a clean cloth or even a bare hand against the site, and hold it there. If the wound gapes, you may have to press just above it to squeeze an artery adequately, and also just below it to collapse large veins and to stop back-bleeding from the lower part of the cut artery. Clots will be firm enough to stop venous and capillary bleeding in ten minutes or less. Quite small arteries may require 15 minutes, and for larger ones the pressure must be maintained until professional help is available. Most nosebleeds, being from small vessels in the front part of the nasal septum, are stopped by pinching the nostrils shut for 2 to 15 minutes. Venous bleeding is easily controlled, yet if mismanaged can be excessive. I recall a lady brought in with a towel around her leg soaked with blood from a pinhole in a varicose vein; slight finger pressure ended the flow at once.

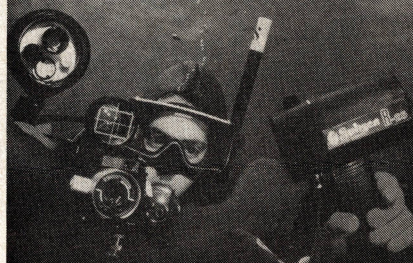
Pressure Points

If direct pressure alone isn't quickly effective, simultaneously pushing on a pressure point may help. This is any place you can feel an artery by its pulse and compress it against an underlying bone. The main ones are the carotids in the neck, the brachials inside the upper arms, and the femorals in the groins. You can trace out others by carefully feeling yourself or your more compatible friends. Don't expect complete control from a pressure point alone, for most areas get blood from more than one artery, some of them inaccessible.

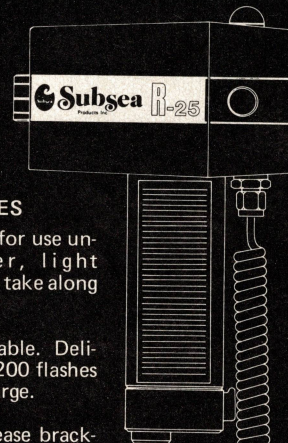
Pressure Dressings

Once clots are forming and bleeding slows, you can usually maintain control with a pressure dressing. This is a gauze pad, a towel, or whatever, stuffed into or upon a wound and held with a firmly wrapped bandage. Aside from the pressure applied, the weave of its fabric forms a meshwork that aids clotting. But watch out — dressings can be dangerous! Consider our first example — the fellow whose hand wouldn't stop bleeding. Recall that arteries carry blood to the hand at high pressure and veins carry it off at low pressure. His bandage, wrapped about the hand and wrist, was not compressing the cut artery enough to

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stop it, but was blocking venous return. What happens is that blood entering through the intact arteries gets shunted through interconnections into the cut vessels, and bleeding is intensified. Simply removing the turns of bandage around his wrist immediately slowed the bleeding. The lesson is, never wrap any bandage above a wound with more tension than you apply to the wound itself.

Cotton packed into a nostril will control most nosebleeds, though you may have to tamp it in tightly. If that fails, suspect a posterior nosebleed; they too require pressure, but only doctors are equipped to handle it. There are of course situations where pressure dressings aren't appropriate; you wouldn't want such pressure against the front of the neck or an eyeball.

Elevation

Why not accept some free help from gravity? The rate of bleeding is proportional to the pressure in torn vessels. For every foot you can raise the injured part above heart level, the pressure will drop 24 mm of mercury. Conversely, letting it hang down will increase the pressure and the bleeding. Bad facial bleeding calls for a seated or semi-seated position if practical, but if the patient is not fully conscious, don't use any posture that could let blood run into his throat.

Tourniquet

The controversy rages. Thirty-five years ago outfits like the Boy Scouts were strong on tourniquets. It seemed so logical — you just tighten a band about a limb till all arteries are collapsed, and bleeding becomes impossible. Alas, a little knowledge proved worse than none. More than a trickle of red, and someone would be sure to slap on a tourniquet, often to the patient's great sorrow. Sometimes it would loosen a little when nobody was looking, blocking only the veins, and so increase the bleeding. Or perhaps, due to shock, the arterial pressure was low when the tourniquet was applied, then later recovered to exceed tourniquet pressure, with the same result. Sometimes a narrow band, a piece of rope for example, would be applied too tightly and damage a major nerve or vessel. Occasionally the tourniquet would be left on too long and the limb lost to gangrene.

The pendulum swung, and the Red Cross came out with a blanket denunciation of tourniquets, since in the net they were doing far more harm than good. But some accident victims continued to bleed to death, and people, of course, asked what good was an intact nerve or limb to a dead man. So the Red Cross modified its stand and said OK, use a tourniquet if you're convinced you must risk a limb to save a life. It was a sensible policy, yet opponents have raised two questions. First, is the average person able to make such a judgment? We're not



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sure — he just has to do the best he can. Second, do situations really occur where a safer method won't suffice? Not often, but definitely yes. If a limb is amputated it can be quite difficult to pressure-dress the stump, and there's little reason to fear a tourniquet anyway. Deaths from shark bites and propeller injuries are usually due to blood loss. With a very large or deep gash, direct pressure may not work well if too many vessels are cut or if they are cut at a level not near the skin wound, as when a gash slants upward. Or there may be multiple deep gashes on one or more limbs and you haven't enough hands to go around. Or you may have absolutely nothing with which to fashion a pressure dressing. Or in cases where direct pressure does work but a pressure dressing doesn't, you may have to let go to rescue someone else, or tend another injured person, or operate a boat, or go for help, or carry the patient.

So you decide on a tourniquet. Some simple precautions will greatly reduce the hazards. Use a wide band to minimize nerve damage. Put it just above a thigh or upper arm wound — no point in jeopardizing more of the limb than necessary. However, for a lower leg or forearm wound, it may be better to put it above the knee or elbow, for lower down

the nerves and arteries are nearer the skin and more easily damaged. Tighten it just enough to stop the bleeding, and watch it closely. If you can't watch it closely for a short time, tighten it a bit more until you can. After 20 or 30 minutes, loosen it slowly. If bleeding recurs, cinch it up again. If there's little bleeding, apply a pressure dressing and watch the wound. If you can't keep an eye on it, allow several minutes for circulation and cinch up again. But don't loosen a tourniquet at all if the patient is very weak or shocky, for he may not be able to tolerate the sudden influx of waste products that have accumulated in the limb while deprived of circulation. Never cover a tourniquet. Attach a tag to the patient saying when it was applied, and make certain that whoever takes over knows about it. To sum up, I would recommend that you use a tourniquet when and only when bleeding is life-threatening, you know what you're doing, and you've no other way.

Other Aids

Cold applications may reduce bleeding by inducing vasoconstriction. Ice applied about the nose and behind the neck might shorten a nosebleed. With a tourniquet, packing the limb in cold wet towels will lower its metabolic requirements and stave off gangrene a while longer. Keep the patient comfortable and reassured; if he's agitated his heart will go faster and he'll bleed more. Some first

aid kits will contain intravenous volume expanders, hemostat clamps, and so on. Unless specially trained and experienced, don't play with this stuff — you may clamp a nerve along with the artery.

Pitfalls

Sometimes a torn artery doesn't bleed, if the injury was by crushing, as in our example of the train running over the leg. That's because it contracts in spasm, and its large area of torn lining attracts masses of platelets and releases clot-inducing factors. Don't leave such a wound unwatched, for if the artery spasm relaxes before the clot is firm, you'll have a real gusher.

Using an injured limb will increase its circulation and encourage bleeding, and disturbing the wound may dislodge a clot. Probably the commonest error is impatience: you're holding a handkerchief against a wound or pinching a nose, and every few moments you back off to see if it's still bleeding. Of course it is, since you keep disturbing the clot.

And then there's the occasional person with a disordered clotting mechanism. You've heard of hemophilia, there are other, commoner types. Some people take anticoagulants for medical reasons. These need careful attention to even minor wounds.

An injured area is likely to swell. If you wrap it firmly and then it swells, the in-

(Continued on Page 43)

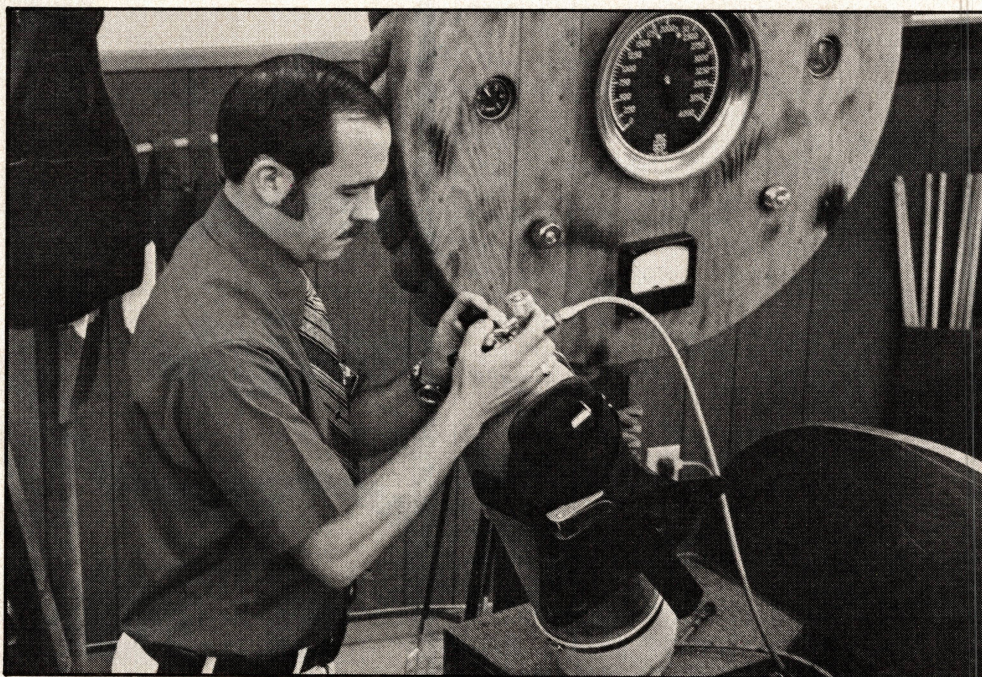
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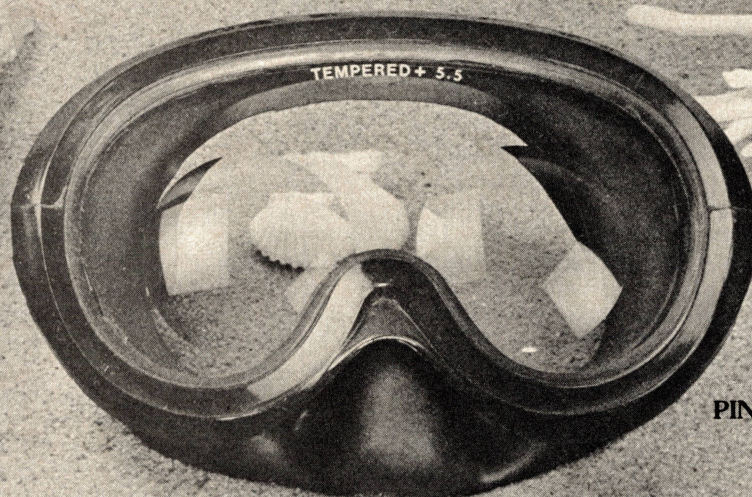
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The Sportsways W-600-0 Hydronaut Octopus System

SDM PRODUCT REVIEW

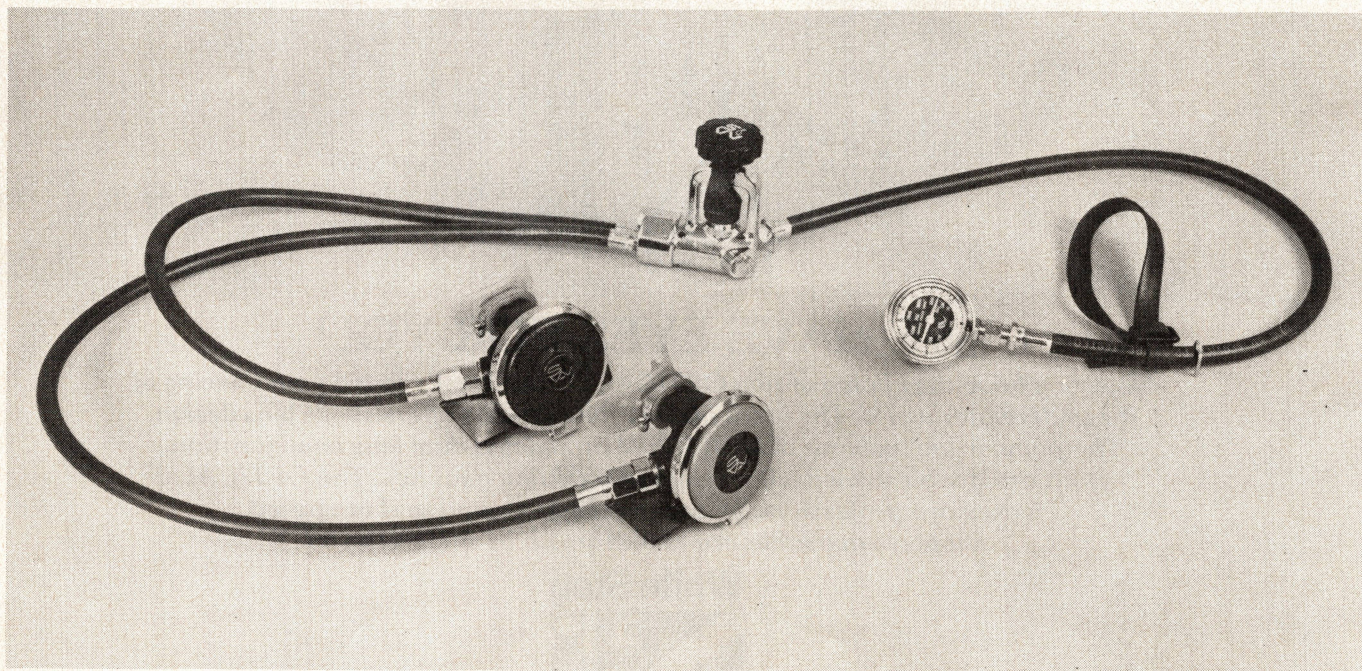
By Jim Hall

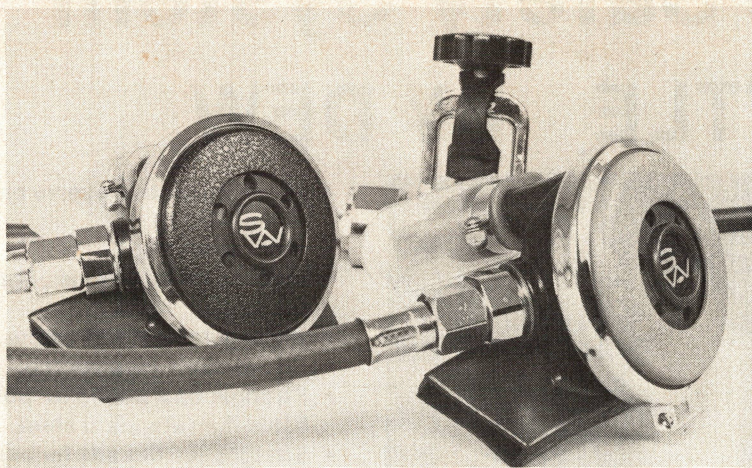
Sportsways' W-600-0 Hydronaut Octopus System is the latest quiet innovation from diving's most dependable pioneer. The heritage of the Hydronaut is a remarkable testimony of inventiveness and marketing courage: In 1958 Sportsways began a revolution when they were the first manufacturer to introduce the single hose regulator to American divers; in 1959 they introduced the Sea-View®, submersible pressure gauge, and started the trend toward integrated instruments by combining it with a capillary depth gauge. The W-600-0 is the latest refinement of the first octopus rig offered in the United States in 1971.

Now, Sportsways has combined their time-proven design with the latest technological advances to create a regulator and octopus system of all-around utility. The second stage design features a unique and eye pleasing low-profile shape. Injection molded of tough Arylon T® plastic, a tetra-polymer by Uniroyal, the second stage cover on the Hydronaut regulator is black while the cover on the octopus system is orange. Blue is also available for a second stage cover. Sportsways paved the way for plastic second stages, which are lightweight and corrosion free.

Several important features are apparent with Sportsways' second-stage construction. The diaphragm is protected by two covers; a large-holed, hard-plastic cover for shock and abrasion resistance and a soft, inner, neoprene cover that is easy to clean of sand and debris. Turning the second stage over, you will notice that the exhaust tee is held on with two stainless steel screws. If you have ever tried to replace an exhaust tee you will appreciate the quick and easy maintenance this feature offers. Another nice feature that all Sportsways regulators have is the soft, silicone-rubber, hypo-allergenic mouthpiece.

Sportsways' years of engineering experience really shows inside the second stage case. It is shaped so that the air flowing from the demand valve orifice does not push against the diaphragm and create extra breathing resistance. Resistance is also reduced by the low friction Teflon-coated demand lever that eliminates sticking during long storage periods. Inhalation effort can also be controlled by a unique adjustable orifice that allows your regulator to be tuned to your specifications without removing the diaphragm cover. Prior to the introduction of this feature, fine-tuning a regulator was a noisy process involving a small nut near the demand lever and reassembling the





The second stages of the Hydronaut system are injection molded of tough plastic, making them lightweight and corrosion-free. A unique adjustable orifice allows the regulator to be tuned without removing the diaphragm cover.

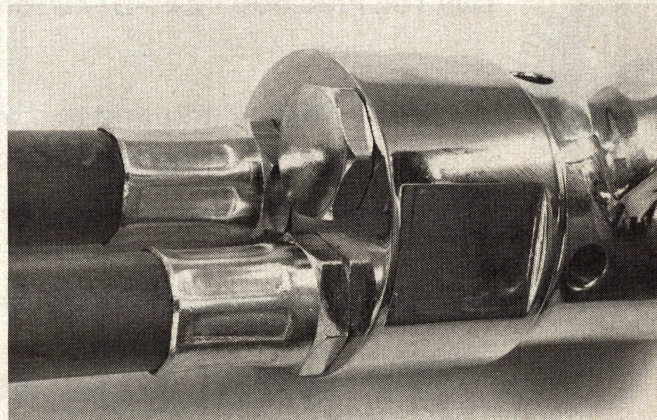
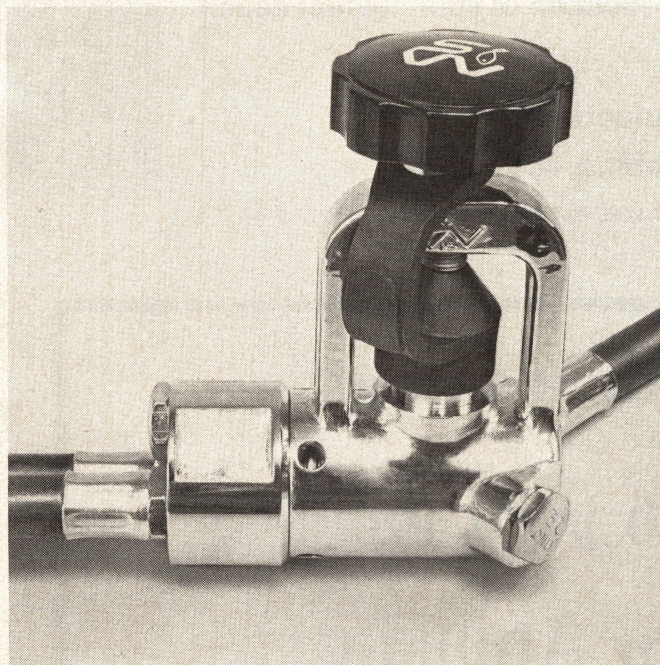
second stage after each adjustment.

Moving to the first stage, we find several commendable features. Known as one of the most dependable first stages available, the Hydronaut is balanced and designed for low-cost maintenance. It has four low-pressure ports and a right-handed octopus. There is also a patented, ultra-low pressure port for a BC inflator. This specially designed orifice restricts airflow to the inflator hose to 5 cfm, compared to 30 cfm for most other mechanisms. Unlike other first stages with right-handed low pressure ports, the W-600-0 eliminates the need for an accessory tee to route your BC inflator hose to your left shoulder and thus prolongs hose life.

For open-water testing, we took the Hydronaut Octopus System to Catalina Island for a day of diving on Farnsworth Banks. The W-600-0 system comes complete with a Sea-View® gauge and an octopus unit with a 39 inch hose. The Sea-View® has a sturdy brass housing, a specially designed raised bezel to protect the lens and a spiral-wound bourdon tube. A protective rubber cover is available for \$2.50. As you would expect from the lauded Hydronaut, the entire W-600-0 Octopus System performed well.

Although we recommend that you don't attempt to service your regulator without special training, the adjustable orifice feature of the W-600-0 really impressed us. Studies at UCLA have shown that *all* regulators that sit for any length of time tend to de-tune. This is one reason for regular checkups. Our first dive with the W-600-0 was to 150 feet and it performed capably. After our first dive we disconnected the second stage sleeve, attached Sportsways' special tool and fine-tuned our W-600-0 in less than 20 minutes — not remarkable until you consider that this was done using two adjustable wrenches aboard a 21 foot Boston Whaler. Fine-tuned, the W-600-0 performed admirably for even the most critical of our test divers. The adjustable orifice should be a real boon to traveling divers who often need maintenance far from their local dive shop.

The Hydronaut regulator is a bargain at \$150; and the entire W-600-0 Octopus System, with all its components, is also attractively priced at \$231. Its dependable, straight-forward design has made it the most copied regulator in the world. In this age of copies, why not return to an original with your next regulator purchase? 🐟



The W-600-0 (far left) comes complete with a Sea-View® gauge and two second stages. The octopus has a 39 inch hose. There is a specially designed ultra-low pressure port (left) so the BC inflator hose does not have to be routed over the left shoulder. The first stage has three other low pressure ports.

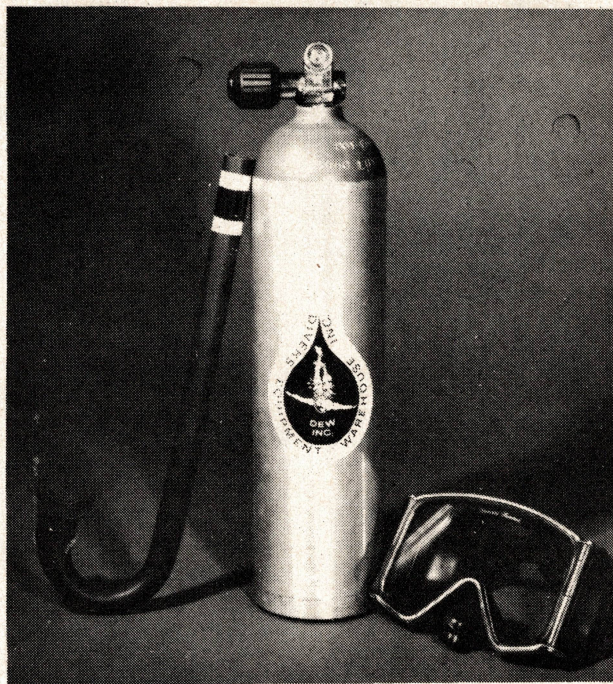
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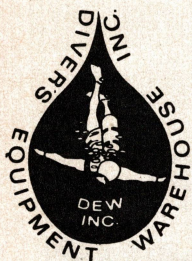
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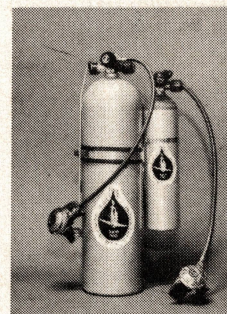
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Medifacts

(Continued from Page 38)

creased compression could shut off all circulation, with disastrous results.

Oxy-hemoglobin is a strong color pigment, so a little blood spread around seems like a lot at first glance. Don't get excited and take heroic measures till you've had a good look. A man can lose a surprising amount without grave danger because of the compensatory mechanisms already described. On the other hand, if he has lost a lot, don't think that because he looks fairly good you can let him lose more. Compensation has limits, and beyond them is sudden shock.

If you've stanchied your buddy's serious bleeding and need to carry him out, but he's clearly in shock, he may not tolerate the moving. Hold off a while till fluid shift from other tissues restores some of his lost blood volume, and he'll do better. Drinks will help, preferably with some salt — about a teaspoon per quart, enough for a salty taste.

Bleeding from Body Orifices

If you suspect skull fracture, don't obstruct blood flow from the nose or ears, or you might divert it into the cranial cavity and damage the brain. Red blood coughed up may have trickled down from the nose, but could be from damaged lung. Vomited blood suggests an ulcer or a torn stomach. It's often coffee-ground in appearance due to the action of stomach acid, but will be red if the bleeding is rapid. Blood passed rectally will be tar-colored if it originated in the stomach or upper intestine, dark red from lower levels, and brighter red from hemorrhoids. Blood in the urine after an injury means a torn kidney or bladder. Fast vaginal bleeding is usually due to an incomplete miscarriage. Who needs a physician? All of the above.

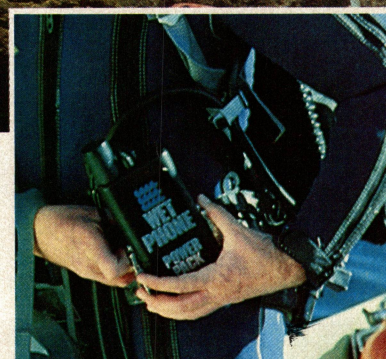
Internal Bleeding

Finally, if an injured person seems shocky (weak, pale, thirsty, thready pulse) yet you see no blood, suspect internal hemorrhage. A hip fracture can cost a quart of blood without such external evidence. Some fractures of the long bones involve torn muscles, and any movement increases or renews bleeding into them; immobilization with a splint solves that problem. A ruptured spleen or liver can bleed fatally; if you're at all suspicious, the patient should be handled very gently and moved to a hospital as quickly as possible. Deterioration of consciousness some time after head injury implies bleeding within the cranial cavity — an emergency that wants a neurosurgeon fast. The specter of internal hemorrhage points up a cardinal rule for the first aider. Know your limitations and stay within them. When in doubt, never hesitate to share the responsibility with a professional. >



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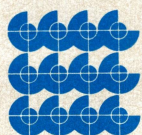
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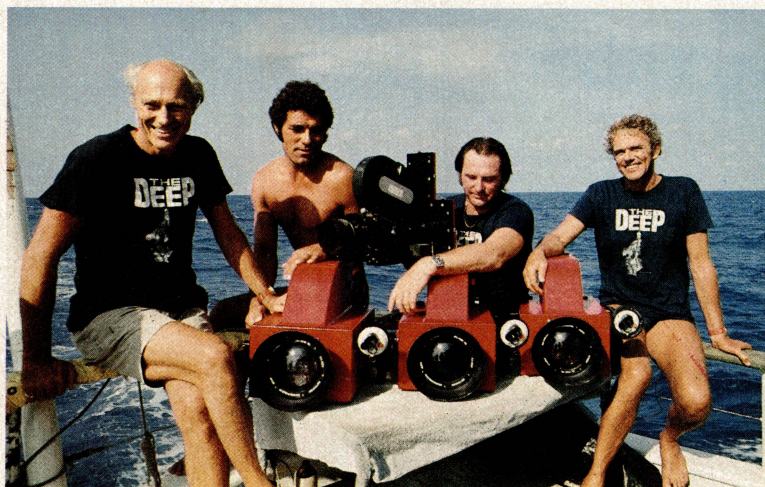


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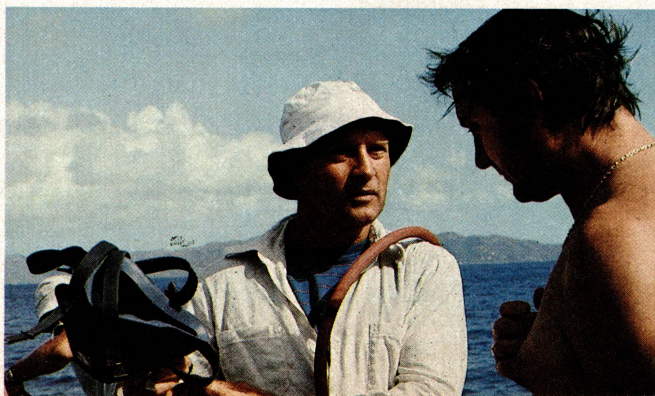
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THE DEEP IN AUSTRALIA



Right: The script called for the actors to be in open water during the shark scenes, so no cages were used. Finding sharks was no problem. Above: Stan Waterman, Wulf Kohler, Al Giddings and Chuck Nicklin, topside in Australia. Left: Divemaster Denny Breese tapes a 12 cu. ft. air bottle to Jack McKenney, to prepare him for a scene in which he must appear to make a free ascent. The bottle was hooked into a Desco system and invisible to the camera when the scene was filmed. Below: Stuntman Howard Curtis discusses a Desco mask scene with Giddings.



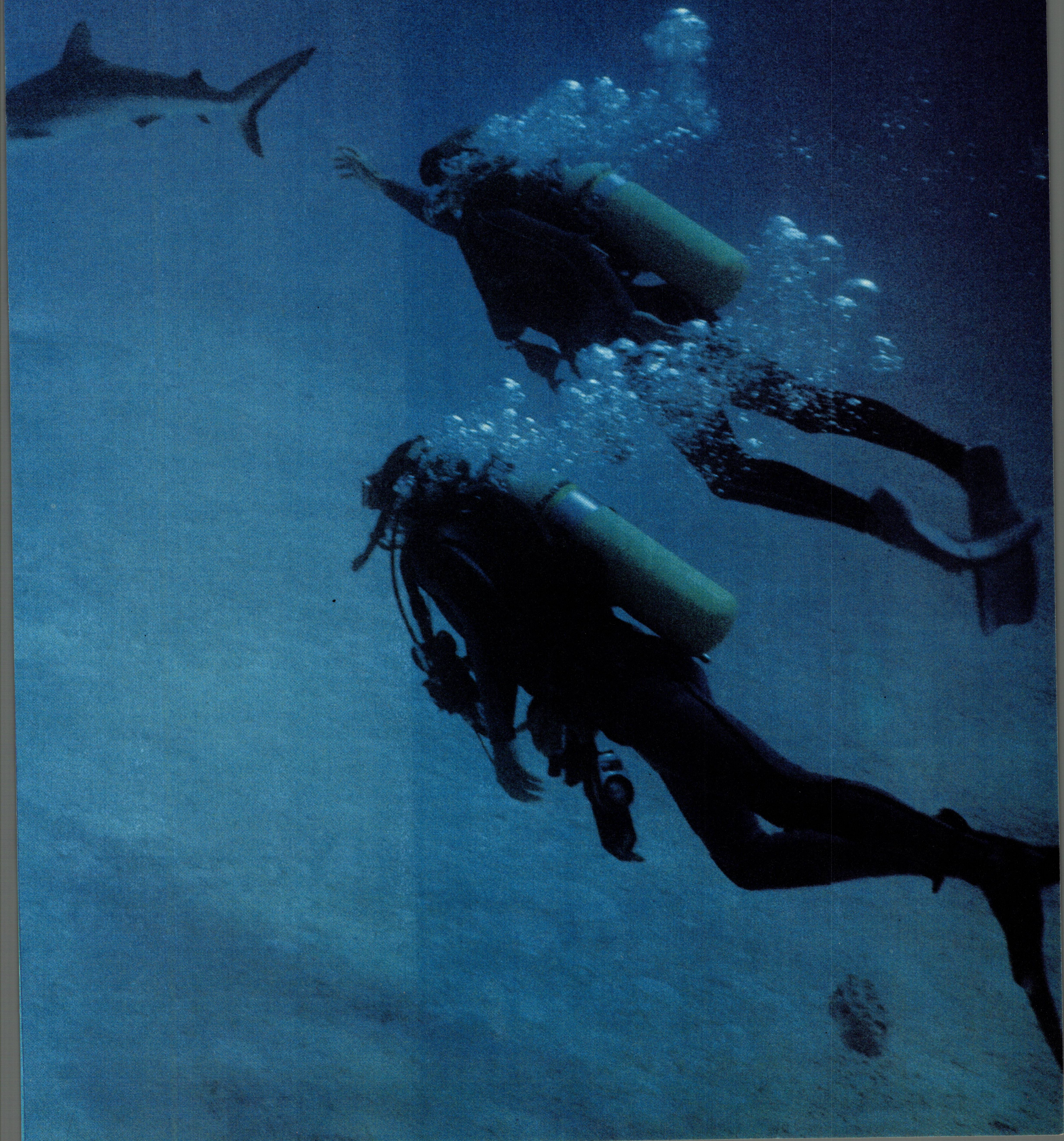
The filming of *THE DEEP*, released by Columbia Pictures in June, began one year ago in the British Virgin Islands. The wreck of the *Rhone* was used for the open water shots to establish the scenes necessary for realism in the undersea epic. The wreck provided everything the script called for: "Schools of silver and yellow fish swim by. There is a huge, majestic hulk of a shipwreck. It has been overgrown with marine life, has become an ecosystem of its own, housing all manner of life. But there is no question about what this monster is: we can see hatchways, portholes, the mast, the propellers. Time has wedded it so thoroughly to the reef that it's difficult to tell where the ship ends and the coral begins."

After five weeks of filming in the BVI, the underwater film crew relocated to Bermuda. Since *THE DEEP* was written about an adventure in Bermuda, it was logical to shoot all the topside scenes on this lovely island. It was here that a one million gallon saltwater pool was constructed as the world's largest underwater set. In the center of this huge fishbowl, chambers were built to simulate the interior rooms of the *Rhone*. They were so realistic that one was tempted to look for artifacts upon entering. These sets were used for the more intricate interior scenes involving the salvage of the ampuls and treasure, as well as some of the fight scenes.

The third and final location chosen for filming was Australia. It was selected because it had in abundance what the film needed for its completion — sharks! Al Giddings, Stan Waterman and Chuck Nicklin were no newcomers when it

By Geri Murphy

photography by Author





comes to knowing where the sharks are and how to make them work for the camera. These three veterans came up with some of the most high-voltage action scenes of the entire movie with a working budget for less than three weeks. There were only 16 actual shooting days in all.

The shark scenes called for in the script were very exact and could not be deviated from in the slightest to maintain continuity. The scenes that were filmed on the wreck months ago had to match the film now being shot. In the British Virgin Islands, Treece was dragged out of the wreck by a shark which had grabbed his Desco hose. When filming picked up on that scene three months later, the shark had to be biting that same hose and swimming in the same direction with Treece on the other end. It was this kind of expertise that Al, Stan and Chuck had, and needed, to pull off some of the most realistic underwater action scenes.

The key to a successful Hollywood production lies in filming the most convincing scenes possible. To accomplish this objective, no expense was spared to transport the 15 members of the underwater film crew and several thousand tons of equipment, including special props, halfway around the world to Australia. From Bermuda, 115 cases of camera gear and equipment, with its crew, traveled to New York, to Los Angeles, to Hawaii, to New Zealand, to Sydney, and to Rockhampton, Australia. In Rockhampton, a bus transported us to our final departure point before going to sea. At Yeppon, all of the equipment was loaded onto the *Coralita*, a 79 foot charter vessel that specializes in Barrier Reef cruises. From Yeppon, we sailed 260 miles out to the Coral Sea, and eventually as far as 450 miles from shore, in pursuit of the sharks.

The *Coralita* itself is a most comfortable ship. It is skippered by Wally Muller with his wife Denise. It can sleep 20 persons (four are crew), with two people to a stateroom. Each stateroom has a sink with hot and cold water, comfortable

two-tier bunks, carpeted floors, wardrobes and drawers. There are five showers and toilets and ample water with an on board desalinator. The *Coralita* has an incredible cruising range of 2000 miles at 11 knots. Almost all of the ship is air-conditioned and excels in comfort for long trips.

Although Nick Nolte, an expert diver by this time, would have liked the opportunity to engage in some of the shark scenes himself, he had to remain in Bermuda to complete topside shooting. Instead, Jack McKenney, former Editor of *SKIN DIVER*, was recruited to act as his double. Jacqueline Bisset, being of a more gentle nature, had little desire to swim with the sharks and was also required to complete topside shooting. Jacki Kilbride was sent instead, as her double. Robert Shaw, too, was committed to continuing the Bermuda filming and was replaced by Howard Curtis, a professional Hollywood stunt man who doubles for Robert Wagner on the popular TV series "Switch." In addition to the original underwater film crew members, two additional divers joined the film expedition: Dr. Stan Berman, who would be available should any medical emergencies occur during the three weeks at sea, and Howard Hall from the Diving Locker in San Diego, who has had experience dealing with sharks, would act as safety man and spear fish as needed for bait.

The work day began much as it did at previous locations. Breakfast was at 7:30 a.m. with a script meeting at 8:00 a.m. to discuss the day's shooting schedule and the responsibilities of each crew member. Denny Breese (divemaster) and Van Worley (equipment coordinator) played key roles in putting together special effects and trick setups masterminded by Al Giddings and company. In all of the shark sequences, Treece and David are both wearing Desco hoses which supply them with air from the surface.

One scene calls for a shark to bite the hose that supplies air to Treece. This presented a potential hazard to Curtis who was

Left: Howard Curtis, doubling for Robert Shaw, acts out a scene from *THE DEEP*. Below: Jacki Kilbride, Howard Curtis and Jack McKenney double for the stars in a scene featuring the airlift. Right Jacki Kilbride doubled for Jackie Bisset in Australia.



doubling for Treece. If the shark's teeth punctured the hose, air pressure could drop, cutting off an adequate supply of air to him. To ensure his safety, the Desco units had to be engineered in such a way that when the shark bit the hose, the diver could switch to an air supply hidden from the camera. This enabled the camera man to continue filming, with no danger to Curtis, even with air seemingly escaping from the hoses.

One of the major scenes was Treece, David and Gail's escape from sharks. A replica of the hatch door which is lying beside the wreck of the *Rhone* was brought to Australia. The script called for a pack of frenzied sharks to be snapping and biting at all three divers, who were standing on the hatch with the dredge upright between them. The bad guys had dropped chum into the water all around them, and the sharks got tangled in the Desco air hoses. Escape seemed impossible. Treece upended the dredge unit and turned the valve on, which sent up a great cloud of air bubbles.

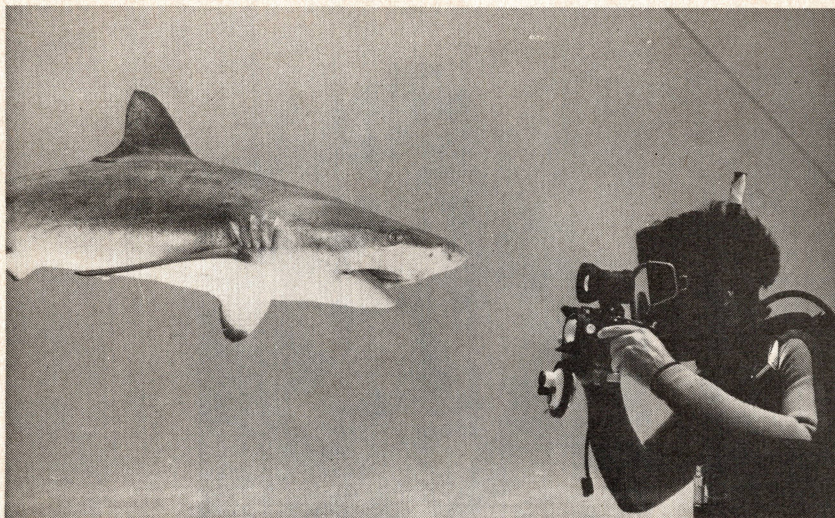
Treece then grabbed David's and his own Desco hose (Gail was in scuba) and severed them both with a wide sweep of his knife, cutting off their air supply. The Desco hoses whipped off into the distance squirting air out the cut ends. Shielded by the screen of bubbles, the trio eluded the sharks and successfully escaped in one of the most exciting action scenes ever filmed. Working out a viable method for the stunt divers to perform this scene with safety, and have it look real, was not easy.

First, a suitable location had to be found. A flat, sandy, bottom was needed for maximum available light as well as to match the film shot in BVI. In order for the actors to make the ascent, a medium depth was a must. And, of course, there had to be sharks. After much searching, an area close to Diamond Island was settled on. It provided all three conditions.

Next came working out a plan to safely get McKenney and Curtis to the surface, without the aid of air supplied from the boat, as they had to cut the Desco hoses. An air supply had to



Australia was chosen as the third location for the filming of *THE DEEP* because it had sharks. Stan Waterman, shown above, with Al Giddings and Chuck Nicklin knew how to make the sharks work for the camera.



Howard Hall, above, films a shark. Right: One scene called for Treece, Gail and David to escape from a pack of frenzied sharks by creating a screen of bubbles. This had to look realistic but not jeopardize the doubles.



be concealed on their person in such a way as to give them mobility for the long, slow ascent, but not be seen by the audience. When filming a complex scene such as this, the actors are not supposed to be in any real difficulty.

A thin 12 cu. ft. air bottle was first taped to the underwater double's body. This would be hidden from view by the work shirts they were wearing. The tiny bail-out bottle was hooked into the Desco system by means of a Y-yoke connector, also hidden under the shirt. The bottle was positioned under the armpit, on the side of the body away from the camera.

When all three divers were in position on the bottom and the camera men and support crew were ready, McKenney and Curtis switched over from surface-supplied air to the bail-out bottles. Then the action began. Treece (Curtis) turned on the dredge sending an explosion of air out the nozzle, and with a dramatic sweep of his knife, cut the non-functional hoses. The three divers made a safe, orderly retreat to the surface with enough air in the tiny tanks to ensure complete safety.

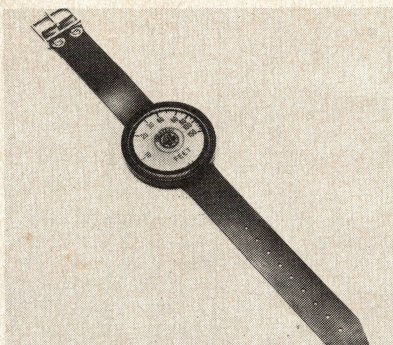
Most of the sharks encountered in the Coral Sea were gray reef sharks and white tips. Upon occasion a whale shark was seen. The whale shark stood out from the others, distinctive because of his very thick body and 10 to 12 foot length. Shark cages were not used at any time because the script required the actors be in open water with sharks moving in and out of the scene. In many ways the sharks were predictable. Almost everywhere we anchored in the waters surrounding Marion Reef and Diamond Island sharks would appear, out of nowhere it seemed, within a short period of time. Howard Hall would bait the area long before the scene was filmed to get the sharks moving in a specific location. At one point in this exercise, Al had just begun filming when Howard, off camera, speared another fish. A dozen or more sharks cruising the area suddenly went into crazy, erratic bursts of speed attacking the fish while it was still on the spear. They went into a feeding frenzy and converged on the bait taking the speargun right out of Howard's hands and snapping it in half. Howard instinctively backed away from the gun, which by now was in the midst of a writhing and twisting ball of frenzied sharks. The attack only lasted about 30 seconds, and once the fish had been consumed the sharks dispersed and resumed their smooth cruising as if nothing had happened. The attack stopped as suddenly as it had begun. Howard picked up the remains of his gun, which was beyond repair, and gave the signal to the rest of the crew that he was O.K. Fortunately the sharks had not wandered into the stunt divers during the at-

tack. They were only a short distance away and had little protection with no weapons in their costumes.

On a more humorous occasion, while the crew was attempting to film some sharks biting the hoses, a 12 foot, slow moving nurse shark moved into the action. Fish heads had been threaded onto the Desco hoses as bait and the big, lumbering, docile creature — attempting to get a free meal — chomped right through the hose and actually got his teeth hooked into it. Bewildered and confused, he struggled to free himself, causing the hose to tear and allowing a steady stream of air to escape into his mouth. The sight could only be termed comical. The shark's huge body rolled over and over, entwining the hose around him, while a stream of bubbles escaped out his gills like steam from a dragon.

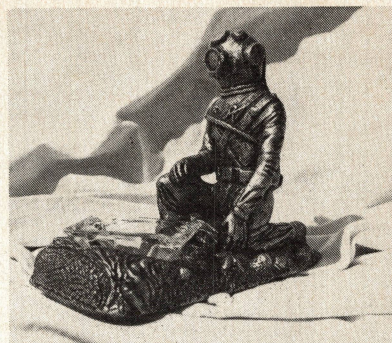
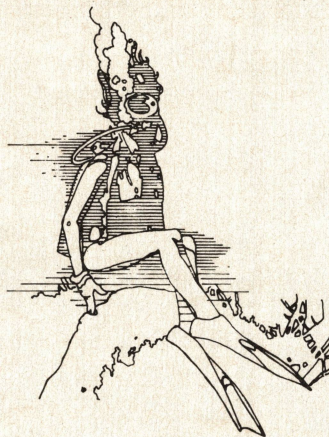
The filming of *THE DEEP* was completed in a little less than five months. During that time, a total of 200,000 feet of film was shot underwater. With the leadership of Al Giddings and Stan Waterman, co-directors of the second unit, a total of 8895 dives were made, 10,780 hours were spent beneath the surface, and 1,054,000 cubic feet of compressed air were consumed. The crew members traveled from their respective homes to the British Virgin Islands, Bermuda and Australia — more miles than around the world.

There were a lot of firsts in the production of *THE DEEP*. For the first time in Hollywood history, a 35mm camera with a Panavision lens was housed for mobile underwater use, complete with reflex viewing and interchanging lenses. It weighed less than eight ounces submerged. Al Giddings designed and built three of these housings, advancing the art of underwater cinematography to futuristic dimensions. For the first time, a major motion picture had 40 percent of the underwater filming done in a theatrical sense, complete with a director, lighting technicians, prop men, an U/W script girl, and dozens more support personnel — all of whom were expert divers. For the first time, an underwater movie set was built containing over one million gallons of seawater complete with fish, coral and moray eels. Innovation is the name of the game in bringing realism and beauty to the screen. *THE DEEP* is truly a film which no diver should miss seeing.



A low profile and a luminous, easy-to-read dial are features of this handsome new Capillary Depth Gauge. The capillary is greatly magnified for better visibility. It reads to 150 feet and comes complete with a depth-compensating neoprene wrist strap and a stainless steel buckle. It sells for \$7.95. Available from Seatec, 425 West Palmyra Street, Orange, California 92666.

New Gear



Now there's even an ash tray with a dive motif! Resting on a treasure chest on the "ocean floor," the Mark V diver looks so realistic you almost expect to see bubbles rising over his head. The ash tray comes in a gold, silver or green tint and sells for \$10, plus shipping. Available from Aqua-Marine Enterprises, Inc., 315 Westbank Expressway, Gretna, Louisiana 70053.

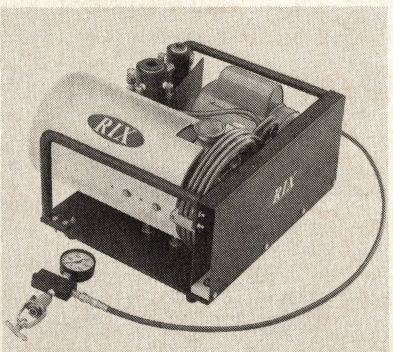


Constructed of black, two-inch nylon webbing and sewn with star nylon thread, the Ice-Cave-Salvage Harness features four, two-inch SS D-rings, a quick release SS buckle and four, two-inch belt slides. It is fully-adjustable to fit any diver. Excellent for attaching buddy lines or tools. \$29.95. From Global Manufacturing Corporation, P.O. Box 15307, Milwaukee, Wisconsin 53215.

The 1867 Deluxe Waterlung BC features double-bag construction, new Taperflex® strap buckles, and an adjustable elbow that lets you position the hose. It provides 33 lbs. of lift. \$85. The 1830 Waterlung Skin Diving Vest has a new design with a large-diameter hose for easy inflation. It provides 16 lbs. of lift. \$50. Sportsways, 2050 Laura Ave., Huntington Park, Calif. 90255.



Proud of being a diver? Here's a subtle way of letting others know what your favorite sport is. These dress belt buckles are nice enough to be worn anywhere. Made from a pewter base, they have an antique-bronze finish and will fit any 1½ inch belt. Model BB1 is the Dacor emblem; model BB2 is a wreck-diving scene. Each costs \$5.95. Available from your nearest Dacor dealer.



Oil-free operation of the RIX Model 1S3B portable air compressors is possible because the piston seals are a self-lubricating Teflon® composite. Because there are no lubricants of any kind in the compression cylinders, air purity equals inlet quality without purification filters. From \$2,000 to \$3,000. RIX Industries, 6460 Hollis Street, Emeryville, California 94608.

Typhoon gloves are made of ultra-soft, one-eighth inch neoprene with top-quality leather palms for durability. They are flexible, five-finger gloves which not only look good but are comfortable enough to be worn all day long. Unaffected by salt water, they sell for \$24.95 and are available from Supreme Divers Ltd., 170 King Street East, Toronto, Ontario M5A 1J3.



Conical foam in the top and bottom of this Accessory Case conforms to any object placed in it, eliminating the need to cut out shapes to fit your instruments, regulator or camera gear. It is 16" wide, 18" long and 6" deep. Of polyethelene, double-walled construction, it has snap locks and sells for \$29.95. Farallon Industries, 1333 Old Country Rd., Belmont, Calif. 94002.

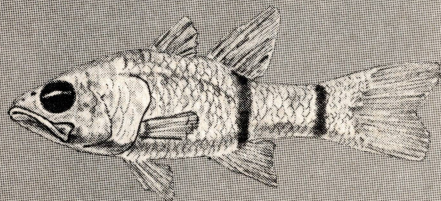
The Barred Cardinalfish

(*Apogon binotatus*)

Hiding by day, evasive at night, and secretive all the time, the barred cardinalfish is not among the most noticeable of Caribbean reef inhabitants. A sharp-eyed diver might see these tiny fishes by taking the time to look into the deep, dark holes in the reef, under ledges, or even inside of empty shells. One would not suspect the huge populations of these fishes for all the hiding they do. Cardinalfishes are nocturnal, leaving their hiding places when the sun goes down to venture out to feed. Like its nocturnal cousins — squirrelfishes, bigeyes and sweepers — red is the predominating color and the eyes are large. It has been speculated that there is a connection between nighttime foraging and bigness of eyes, since many of the nocturnally active fishes have this characteristic. □ In the barred cardinalfish, the red (from which the fish gets its common name) is a translucent, coppery hue which can turn quite pale, depending upon the environment in which the fish is swimming. Through the translucence one can see, at close hand, the inside peritoneum through the body wall. □ Cardinalfishes comprise the Apogonidae family of fishes, characterized by the two well-developed dorsal fins, large eyes and large mouths of its members. Some, possibly all, of the apogonid fishes are oral brooders, incubating eggs in the mouth. Ichthyologists James Bohlke and Charles Chaplin found indications in previous research that the oral brooding is more characteristic than exceptional in the family. Most evidence points to the male as the incubator of eggs, though

there is still speculation on this. It is known that the males have larger and deeper heads than the females. One theory is that the egg mass is picked up in the mouth only when danger threatens. □ There are 20 shallow water species of cardinalfishes in the western Atlantic, but the barred cardinalfish is easily distinguished from the others by the two narrow, vertical black bars on the body, the first just after the second dorsal fin and the other on the base of the tail. The Latin word *binotatus* refers to the two-bar characteristic, and at one time the fish was commonly called “two-

lined cardinalfish.” There are other species of cardinalfishes that have two bars or markings in almost the same locations of the body (*A. townsendi*, *maculatus*, *robinsi*, for example), but *A. binotatus* is the only one whose bars are about the same size, looking almost identical. In the others the second, posterior bar or



marking is much broader. □ Where they occur, there are good-sized populations of cardinalfishes, though it would not seem so since they hide during the day. The fish lives in both shallow and deep water; John Randall's specimens came from between 2-160 feet. At night, they have been observed several feet above the bottom where they appear to feed mainly on small crustaceans in the plankton (Randall). The barred cardinalfish has been recorded from Bermuda, the Bahamas and Florida, to Venezuela, and has been observed alone in an empty shell or cubby hole, or in dense aggregations under ledges in the reef. ➤

Photo By Frank Trousdale - Text By Hillary Houser

Photo was taken in 30 feet of water, at night, off Grand Cayman on the *Balboa* wreck. Trousdale used a Cannon F1, in a Hydro 35 housing with a flat port, Subsea Mark 150 strobe at 1/60 second, f16, one foot from the subject.

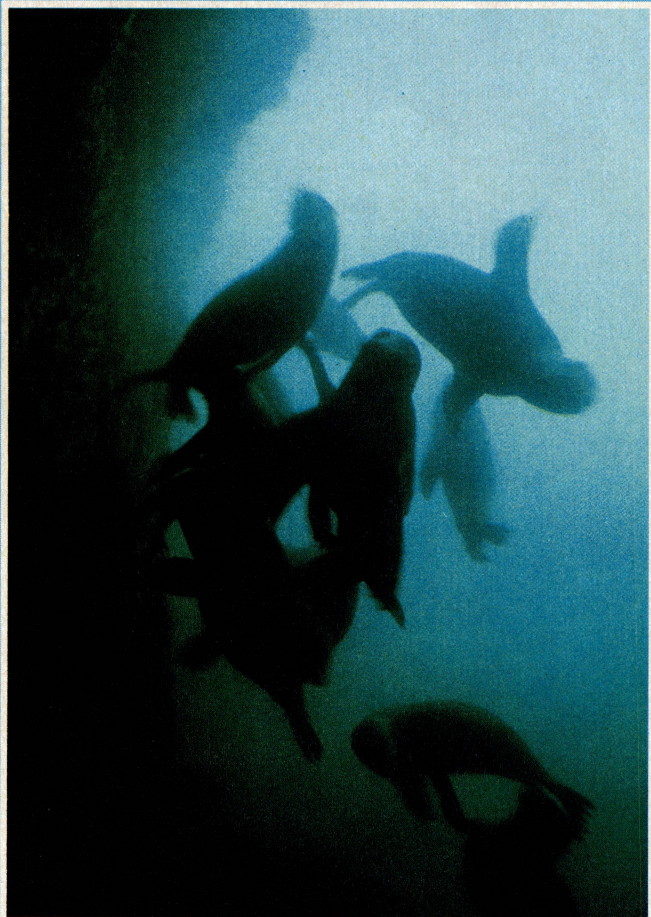


PINNACLES IN THE SEA

California's rugged, uncharted and untouched dive spots

By Andy McMullen

A pod of California sea lions frolic close to Richardson's Rock.



"How deep did you say it was here?" I asked. A few feet away, directly on our left, just a couple of feet out of the water was Wilson's Rock. We knew the area around the rock was deep, and that uncharted pinnacles come dangerously close to the surface. I had just thrown in a hand fishing line. It had hit bottom in what seemed to be only eight feet of water.

Bob Evans was at the controls on the bow of the boat, his yellow slicker a sharp contrast to his black curly hair. After my question, his face took on a worried look. Suddenly, before either of us could think, a giant wave came over the bow,

pressing me against our five hundred pound portable ice box and threatening to wash us overboard. This was

my introduction to Wilson's Rock. No one was hurt and nothing was lost. Luckily, the wave pushed us away from the rock.

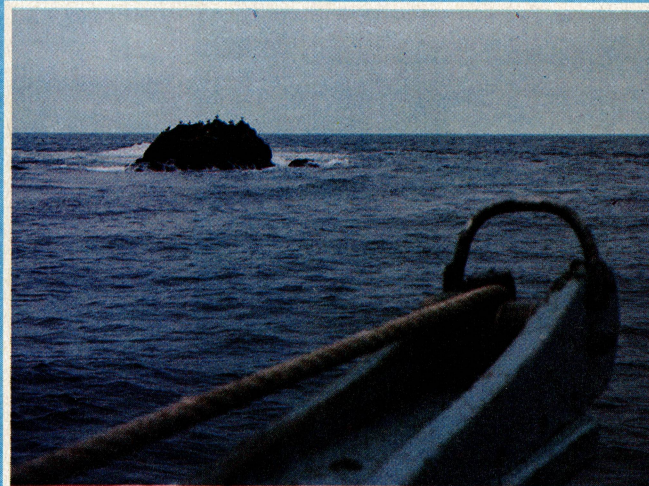
Bob had always raved about that untouched dive area just a couple of miles north of San Miguel Island. It sits out in virtually open water. A few miles north of Wilson's Rock is Richardson's Rock, big enough to support marine mammals and water fowl. Both of these lie exposed to the brutal weather that howls down from the north beyond Point Conception. Since the weather is so prohibitive the area is seldom visited.

This was my first visit, and after I jumped in, I realized that everything Bob had said about the diving was true. We swam over a shallow area. The mild current made the palm kelp and eel grass dance, revealing many large red abalone. As the kelp waved back and forth I saw a huge cabezon and the area was filled with large rockfish.

Bob led the way down a canyon that seemed to go on forever. We were at 50 feet and swimming along a rock wall that supports a whole community of life; giant green anemones, feather dusters, strawberry anemones, club anemones, starfish, and abalone, to mention a few. We continued down the canyon; which became narrower.

Finally, we came to the bottom, which was covered with a gravel composed of thousands of tiny bits of shell. Down here at 125 feet, it was darker, but the water was crystal clear. Looking up

North of San Miguel Island, Wilson's Rock sits out in open water.



toward the surface we could see a school of rockfish.

Swimming along the bottom, I came to a giant sun star. I held one of its many tentacles. They were soft, in a peculiar way, and pliable. There were places where the starfish covered the bottom, feeding on the mussels that had fallen down from canyon walls. Sea urchins, sea cucumbers, and tiny, but colorful, sponges grew on and around the rocks. Spider and cancer crabs were scurrying about in search of food.

Bob tapped my shoulder. I looked up and noticed his pointing to an electric torpedo ray. I swam closer to examine it, taking care not to touch it. The ray emits an electric charge which paralyzes its victims. Running low on air, we started to swim back. Floating on the surface was a comb-jelly. Undulating colors pulsed and throbbed from light refracting from the combs, which give it motive power.

As I climbed on board, my mind was filled with all the dazzling colors of the life we had seen. I looked over at Bob and could instantly tell by his expression that we would make another dive. I looked toward the north and saw Richardson's Rock. Pointing toward it I said, "Why don't we dive there?" In a short time we were on our way.

Richardson's Rock is farther north, more exposed and bigger than Wilson's Rock. Diving there offers the chance to swim among the sea lions. Anchoring was a little bit more difficult in 150 feet of water, but on such a calm day it was manageable. As we readied ourselves to go in the water we glanced over at the rock. Sea lions landed and took off in the gentle but forceful surge that washed on the rock. We swam 50 yards to Richardson's across a blue void of deep water. There's an extremely steep drop-off on Richardson's and we found ourselves hugging the rock as if we were glued to it.

At 20 feet I couldn't help but notice some intense purple coral. We continued down the rock and stopped at a depth of 80 feet. We sat at the mouth of a small cave that was lined with giant scallops. Looking down, we could see the bottom slope off into the depths and out in front of us was blue water.

On the way back we were visited by a small pod of sea lions. We noticed that they stayed as close to the rock as possible. The open waters around Richardson's Rock provide an excellent feeding ground for large predatory fish and mammals. We swam back to the boat, our day of diving ended. 🐠



The canyon walls at Wilson's Rock seem to go on down forever. A large cabezon uses a cluster of club anemones as a pillow.

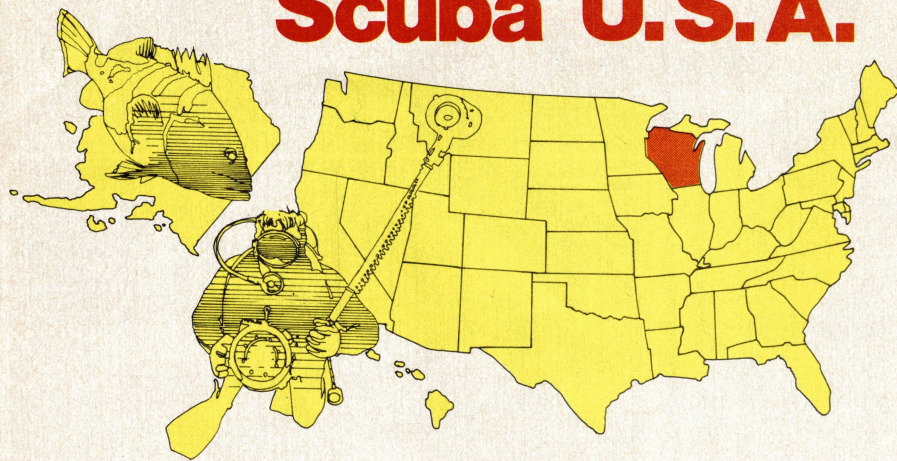
At Wilson's Rock, the author encountered an electric torpedo ray.



photography by Bob Evans



Scuba U.S.A.



WISCONSIN'S Northern Lakes

By Douglas Stamm

The lakeland area of northeastern Wisconsin has long been a haven for fishermen seeking the muskellunge and campers searching for serenity among quiet lakes and forest. Only within recent years has this area seen the influx of divers who come to view these northern lakes from a different perspective. They come to see the inhabitants, places, and relics that for so long have been hidden beneath mirrored surfaces.

The northern lakes of Wisconsin offer much to the freshwater diver. Because their waters are cool and low in dissolved minerals, they are relatively algae-free and clear. Visibility to 50 feet is not uncommon, and as many freshwater divers know, such waters are not easily found. Other lakes are spring fed and provide even better clarity. The great majority of lakes in this region have yet to be visited by their first diver, and this alone yields countless opportunities for the underwater photographer and relic hunter.

Upon entering these waters you will find many species of fishes curious and trusting in their approach to a diver, and they will readily take a handout of chopped crayfish or clam. There are others such as the muskellunge that, similar to the barracuda, appear suddenly from nowhere to circle and observe the bubbling intruder. Some of the muskellunge, in fact, closely resemble the large Caribbean barracuda not only in appearance but also in size. Looking behind you and seeing a five foot muskellunge is something not soon forgotten.

This northern environment can reveal a surprising variety of life to the freshwater diver. In the darker expanses of deep water, or in shaded areas near shore, large schools of walleye are easily found. Large groups of rock bass appear from their cover of sunken trees and man-made brush shelters to peck at their reflections in face masks and strobes. The colorful pumpkinseeds swim among vegetation and join curious bluegills as they cautiously approach and stare. The largemouth bass and northern pike peer from beneath floating logs or vegetation cover. Giant tadpoles, six inches long, inhabit warm and sunny shallows. Tall beds of potomegeton vegetation reach from depths of 20 feet to the surface and create a green maze of corridors broken by schools of darting fish. At the edges of vegetation, rivers of small minnows move by, reflecting sunlight into a thousand flashes.

Divers at dawn or dusk can find beaver working around their lodges and dams and can get a rare glimpse of an otter diving for fish. One of the large northern diving birds, the loon, is a common resident of these waters. Underwater photographs of any of these animals are extremely rare, and anyone lucky enough to be ready for an encounter with them could capture a unique prize on film.

A slow and closer look at this freshwater world can reveal a multitude of life easily passed over because of size or camouflage. Some species of the most colorful freshwater fish in North America — the two inch darters — abound in these northern waters. Freshwater sponges are plentiful here and appear as bright green stalks or patches on the topside of logs and boulders. Other species of the sponge may appear as basketball-sized masses of mosaic gelatin. Clams and delicate snails of many species are present. Perhaps the most colorful inhabitant here is the red watermite. Though only four millimeters (1/6 inch) in length, it stands out scarlet red in a world of browns and greens. All of these small creatures make interesting subjects for observation or macro-photography.

Night diving in northern lakes will reveal an entirely different aquatic environment. Similar to many oceanic fishes,



photography by Keith Nelson

freshwater fish can also be approached and touched in darkness. The muskellunge can best be observed and photographed at night as it stares blankly, seeming to sleep. However, approaching these at night should be done with caution. The muskellunge, when touched, will bolt blindly at incredible speed in a random direction often bouncing off the bottom or slamming into logs or boulders. Being on the receiving end of a heavy, swift muskellunge has its obvious consequences.

The yellow perch, a schooling nomad by day, rest at night in large numbers on the bottom, or lie nestled in the crotches of

submerged tree branches like flocks of underwater birds. Night brings out the scavengers like the large leech of the genus *Haemopsis* that can extend its length to 18 inches as it gracefully swims in its dark search for aquatic carrion. Also with night, the crayfish roam in their persistent hunt of the dead and dying. When large carrion is discovered, mass feeding frenzies ensue with crayfish attempting to feed on anything or anyone close to their food. Night is the best time to capture the larger crayfish. When boiled ten minutes in salted water these crayfish become "freshwater lobster."

The northern lakes hold a storehouse of treasures for the bottle and relic hunter willing to search. At the turn of the century this area supported an immense lumber industry, and lumber camps continually sprang up and were torn down as lumberjacks logged acre after acre. Much of their old equipment and garbage was more easily thrown into the ever present lakes than buried. Bottle hunters finding an old lake edge dump site may find a virtual gold mine. Small fortunes have already been made by bottle collectors locating areas littered with the evidence of the Wisconsin lumberjack's taste for beer. Other finds have included old pistols, axes, two-man saws, and rail spikes and equipment from extinct logging trains. The great majority of booty still lies on the lake bottoms. A little research in local libraries and museums may help you.

Whether you seek to view or photograph the life in these lakes or hunt relics from the past, your best bet is to stay near shore and shallow. Relatively little is to be seen or found at depths greater than 30 feet. Beyond 30 feet even in late summer there lies the ever present thermocline. Most animals and plants thrive best in the warmer, shallower waters above, and most relics are found within throwing distance from shore.

Finding a place to dive in northern Wisconsin is the easiest part — just go there and pick a lake. Finding the best places to dive requires a little initiative on your part. Brochures are available from some sporting goods stores that list many of the more favorable dive lakes. The brochures certainly do not list them all, and those listed have seen divers before. A little exploring with local maps and following old logging roads through the forests can take you next to clear, untouched lakes. Because diving is relatively new in this area, few dive shops exist. Air fills can be difficult to get — so the more tanks you are willing to bring, the better off you are. The larger towns such as Rhineland, Minocqua, and Tomahawk will have sporting goods stores that will fill tanks and sell equipment, but their inventories are not extensive. Underwater photographic equipment is virtually nonexistent here. Bring it with you or check with the dive shops in the larger cities on Lake Superior or Lake Michigan. Spearguns are illegal in many northern counties; regulations are available at any sporting goods store. Wet suits are a must for early spring or deep dives.

Accommodations in northern Wisconsin range from public campgrounds to luxurious resort facilities. Many fine resorts situated on good diving lakes offer, for example, two bedroom large cabins with kitchens plus a small boat for \$150/week total. A call or letter to any northern chamber of commerce will give plenty of information on prices and facilities. Reservations should be made in advance for resorts.

Diving and snorkeling in the lakes of Wisconsin's northern forests can be a great freshwater experience. You may not see all of what is described here the first time you dive or in the first lake you try. The number of lakes seem limitless as can be your experiences if you look around. 🐾



photograph by Author



Wisconsin's northern lakes offer cool waters that are relatively algae-free and clear. Many of them have yet to be visited by their first diver. Their large crayfish are delicious when boiled in water and dipped in butter.



photo courtesy of The Mariners Museum, Newport News, Va

WHAT IS UNDERWATER ARCHAEOLOGY?

By Robert F. Marx

Throughout history man has left traces of his presence not only on land but also in rivers, lakes, springs and along the shallow waters of the seas fringing the continents. Due to navigational limitations early mariners tried to stay within sight of land whenever possible and to steer a course from headland to headland, sailing close to shore in order to find a safe haven for the night. Most of the ships which came to grief in the Old World before the Renaissance sank fairly close to shore. With the Age of Discovery, long, open-sea voyages became commonplace but most ship disasters still occurred close to coastlines. Thus, most of the world's underwater archaeological sites are in waters shallow enough for the scuba diver to explore.

There are four basic types of underwater sites. They vary in degree as to number and the amount of potential archaeological data. Shipwrecks in seas, lakes and rivers far outnumber all other sites and because of their time capsule nature generally provide the most valuable information to the archaeologist. The other types of sites: submerged or inundated settlements, religious sites and refuse sites, are comparable to land sites in

that they generally span long periods of time which is reflected in the artifacts from different eras which are found on them.

Until recently what information there was on the history and evolution of ancient shipping had been gleaned from interpreting ancient literary references and iconography (mosaics, bas-reliefs, frescos, decorated ceramic objects, medallions, seals and coins). However, these sources tell us very little about a vessel's appearance, construction, means of propulsion and performance. Ancient authors were not well versed in seafaring and ancient artists often sacrificed detail for decorative emphasis. As a consequence, we must locate and excavate shipwrecks to fill the gap in knowledge of ancient shipping. The trireme was the common warship for a period of more than 500 years, yet virtually nothing is known about it. During the great Athenian expedition to Sicily in the summer of 413 B.C. more than 350 triremes were sunk off Syracuse in naval battles. The discovery of even one of these would provide a staggering increase in what we know about them.

The underwater archaeologist dreams of finding a completely intact, well-preserved shipwreck such as the 17th century Swedish warship *Vasa* raised from Stockholm harbor. Unfortunately the ravages of nature make this an impossible dream in most cases, at least in the depths which can be penetrated with present dive techniques. There are some exceptions to be found at the bottom of freshwater lakes and rivers and in a very few saltwater zones.

In recent years three bateaux (small gun boats) from the mid-eighteenth century were removed intact and remarkably well-preserved from New York's Lake George. They are the earliest examples of American-built vessels, with the exception of a number of Indian canoes. The gondola, *Philadelphia*, lost in a battle with the British in 1776 on Lake Champlain, was also found well-preserved and was raised. Her cannons were still mounted and there were more than 500 pieces of military equipment aboard. The ship is now on permanent exhibit in the Smithsonian in Washington.

The Baltic and North Seas are unique in that, although they are salt they contain thousands of extraordinarily well-preserved shipwrecks. The saline content in the areas where these ships are is less than in other seas and almost all are within diving reach. There is an absence of coral forming organisms and the waters do not sustain the sea teredo or other marine borers. This means that wood and other organic materials are in no way affected, even when unprotected by sedimentary deposits. Although divers have located dozens of old ships resting as if they had sunk only the day before, diving in those areas to work on the wrecks is far from easy. Cold water restricts the time a diver can spend on the bottom and underwater visibility is seldom more than three feet.

During the past decade more than 150 old ships, some dating as early as the 12th century A.D. were found during a land reclamation project draining the Zuider Zee in Holland. Most of these wrecks are as well-preserved as the *Vasa*. In 1957, five Viking ships were discovered entombed in mud under the shallow waters of Roskilde Fjord in Denmark. All five had been deliberately scuttled to protect the entrance to a settlement in the tenth century. Due to the difficulty of diving in those northern waters, a cofferdam was erected around the wrecks, the water was pumped out and they were excavated by land archaeologists. They have been removed from the site, reassembled and put on display. To the disappointment of archaeologists the ships had been stripped before they were scuttled, so very little was learned of Viking rigging. Since the second millennium before Christ men have been sailing the Black Sea, the saline content of which is only about half that of the Mediterranean and it is believed that old ships found there will be as well-preserved as those found in northern waters.

Documentary sources sometimes furnish details of the construction of ships lost in the Western Hemisphere. Circa 1650 the British Admiralty passed a regulation stipulating that all ships had to be constructed from plans, a copy of which had to

be filed in the Admiralty Archives. Not only are thousands of government ships' plans extant but also those for British-built merchant ships and even of many foreign ships which were captured or bought. There is a big gap in our knowledge of ship construction from the time of Columbus until this period. Archives in Spain, France, Holland and other European countries house countless plans and even ship models, but most postdate 1700. Another considerable gap in information concerns early American-built ships. Most extant plans and sketches of American ships date after 1800. Prior to that time most American vessels were made by "rack of the eye" by craftsmen without the aid of plans. To fill in these hazy areas, a modest amount of information can be derived from the excavation of shipwrecks in shallow water and far more will come from wrecks which may be discovered in fresh water or in areas such as the Baltic and North Seas.

The Mediterranean has become the acknowledged focus for most professional shipwreck excavations. This is natural since the Mediterranean is virtually the sole repository for ancient shipping as well as the graveyard for all classes of ships from medieval through modern times. Over a span of 5500 years thousands of ships were lost. Many of them were types not found anywhere else which bore cargoes and other materials not found on land sites. In some cases, such as that of the Bronze Age wreck found off Turkey, items have been recovered for which nothing comparable has been found on land.

Although hundreds of ancient wrecks have been discovered in the Mediterranean in the past 20 years, almost nothing has been learned about the ships themselves because of the lack of wood structural components on the sites. On the other hand, a lot has been learned about the cargoes of these ships and the other articles they carried. As more wrecks are found and identified the trading routes of ancient mariners are better understood. Already archaeologists have shown that their range was far wider than historians previously thought.

Most of the Mediterranean wrecks excavated had cargoes of terra cotta amphorae used in the wine trade. These "five gallon jerry cans of antiquity" as they have been called were also used to store and transport other liquids and such products as brined fish, olives, dried fruits and pitch. A small number of wrecks have been excavated which had cargoes such as plundered works of art, architectural components and sarcophagi. It is a great shame that the majority of wrecks found in the Mediterranean have been stripped by sport divers and no more than a dozen have been excavated by archaeologists who interpreted and published their findings.

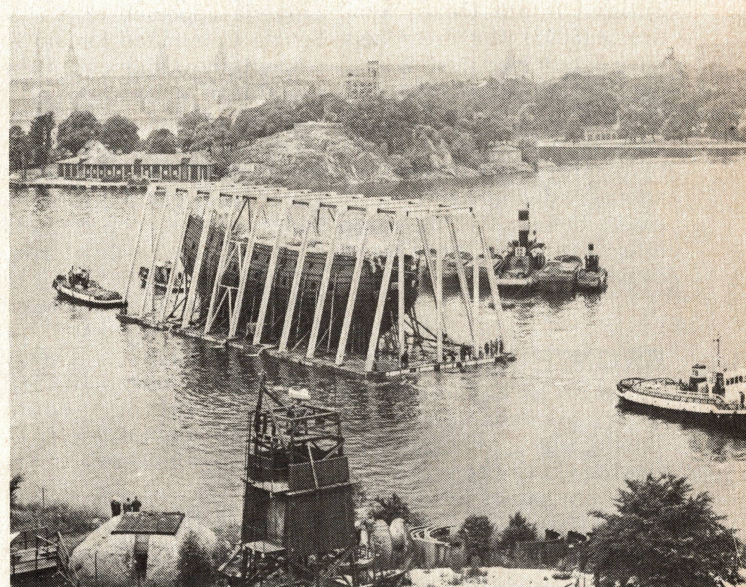
Although the wreck of a 17th century Spanish galleon may arouse less academic enthusiasm than the remains of an ancient Greek or Phoenician merchantman, it is inevitable that New World shipwrecks will eventually receive their due share of attention when more trained people are available to work on them. Certainly to an American historian, one of Columbus' wrecks is even more engrossing than a Roman argosy.

In the early days of skin diving most of the work on New World shipwrecks was left to treasure hunters. The academic world displayed little interest and so ships were ripped to pieces, artifacts wrested from the sea floor, carried off and lost to archaeology. Fortunately, the situation in the United States has changed in recent years. Many sites are still gone over by treasure hunters and amateur divers but increasing numbers are being protected and excavated under the supervision of state archaeologists or by representatives of the National Park Service, the Smithsonian or other recognized institutions. In the state of North Carolina more than a dozen Civil War shipwrecks have been discovered by amateur divers interested in marine archaeology and have been salvaged under the watchful eye of the state's underwater archaeologist, Sam Townsend. Excavation revealed a lot about these ships, their cargoes and armaments. In South Carolina most of the effort has been concentrated on three Confederate blockade runners sunk off Charleston which were located and excavated by a

young amateur underwater archaeologist named Edward Lee Spence. Initially local scholars took a dim view of his activities but as they became aware of the significance of his work they altered their attitude and offered him assistance and support. Dr. Robert L. Stephenson, South Carolina's state archaeologist, said of Spence's work: "The artifacts recovered off these wrecks are clearly a datable series of items which can be used as comparative materials, particularly when digging on land sites." Unfortunately archaeologists in many states do not express interest in helping with underwater projects and most divers working on wrecks are left to their own devices.

The bulk of the shipwrecks salvaged to date have been found in the sea, especially off the coast of Florida. However, there are myriad vessels at the bottom of the Great Lakes and in many other North American inland bodies of water. The chief deterrent to locating and excavating them is cold and murky water. But more and more people seem to be willing to brave the trying conditions and interesting finds are being made.

Most of the ship losses on American rivers and in the Great Lakes are of recent vintage. Although a small number of vessels were plying the Great Lakes by the latter part of the seventeenth century to supply the needs of early settlers and to transport the products of forest and field, commerce didn't

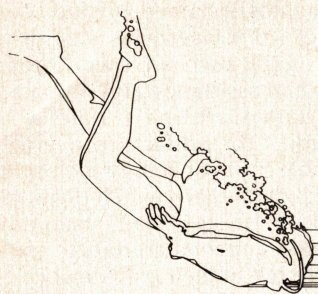


Underwater archaeologists dream of finding intact, well-preserved wrecks such as the 17th century Swedish warship *Vasa*.

really open up until the advent of the nineteenth century. Lake traffic was stimulated by the discovery of iron ore in Minnesota and locks were built connecting the lakes to one another and in 1855 to the St. Lawrence Seaway. Around this time the rapid expansion westward made Chicago the stepping-off point by train for settlers headed for the frontier. For a time there were no connecting rail lines from the east, so settlers were transported on the Great Lakes as far as Chicago along with locomotives and rolling stock. An astounding 5000 vessels, at least, sank in the Great Lakes and await examination by underwater archaeologists.

A large number of British, French and American warships were also lost in the lakes. The first warship built for use on the Great Lakes was the British ship *Halifax* in 1756. Several years later it was lost on Lake Ontario and not long ago it was found and salvaged. During the War of 1812 both British and American vessels were lost on the Great Lakes in inclement weather and in battles. Two American gunboats, the *Hamilton* and the *Scourge*, both two-masted schooners, were discovered in 1973 in Lake Ontario near Niagara Falls. They lie at 275 feet

(Continued on Page 92)



News Briefs



By Hillary Hauser

REFLEX STUDY

The breathing habits of deep-diving Antarctic seals are being studied by doctors and scientists at Massachusetts General Hospital who are trying to solve the mystery of Sudden Infant Death Syndrome (SIDS). The researchers have determined there is a reflex in the back of the seal's throat which causes a great slowdown in heartbeat and respiratory rate when the animal is diving, and the scientists believe that the same reflex could be the hidden cause of SIDS.

BRONZE AGE FIND

A team of Canadian and American archaeologists is digging out a Minoan town that may have been the most important harbor in southern Crete 3500 years ago. The site is a sandy hillside overlooking the Libyan Sea, near Matala, Crete, and is believed to be the main link between the palace at Phaistos and the sea during the middle and late Bronze Ages.

ANDROSIA RAGE

Small Hope Bay, Andros, is well-known as a dive resort, and now it's making its mark in the fashion world. "Androsia" is the name of the batik designs that are being produced in the tiny factory at the dive resort which is operated by Dick and Rosi Birch. Rosi and a group of Bahamians are producing original wax paintings on cloth and fashioning them into caftans, skirts, shirts, dresses, halters, hats and wall hangings. For information, write Androsia,

Small Hope Bay Lodge, P.O. Box N1131, Nassau, Bahamas.

PLEA FOR ISLANDS

In March, the high chief of the U.S. Trust Territory of Micronesia appealed to a U.S. Senate Committee for aid in stopping development of the mammoth oil tanker port planned for the islands (NB, March, May). "We plead with the committee not to allow the United States to push the Superport project on us," said Ibedul Yutaka Gibbons, paramount chief of the Palauan Islands. The Ibedul spoke at a hearing before the Senate Committee on Energy and Natural Resources, and said the Superport would wreck the now pristine environment of the islands.

PARK FOR WHALES

Last spring, a group of scientists observed and studied humpback whales as they congregated off Maui in the Hawaiian Islands. The project was supported by the World Wildlife Fund, which is seeking the establishment of a U.S. marine park for whales. Scientists involved were Dr. Roger Payne, his wife, Katy, and Dr. Sylvia Earle. Underwater filmmaker Al Giddings filmed the whales and the researchers at work for Survival Anglia, Ltd., which is producing a television special on the whales. The scientists particularly watched the feeding behavior of the endangered species, and noted the ecological significance of humpbacks in Hawaii. Additional support for the whale watching came from National Geographic and the New York Zoological Societies.

UNION SALVAGE

The Union blockade ship *Hatteras* has been found off Galveston, Texas, and a group of divers and scientists is trying to raise the ship for display in a maritime museum. The *Hatteras* was one of 57 Union ships sunk by the Confederate *Alabama*, and went to the bottom in January of 1863. Paul A. Cloutier, a Rice University professor, pinpointed the location of the wreck last year in 60 feet of water after he found the hull nameplate. Cloutier has worked out a cooperative agreement with the Galveston Historical Foundation to raise and restore the ship.

CHEMICAL SPAWN

A UC Santa Barbara biologist has discovered a chemical mechanism which induces the spawning of abalones, oysters and mussels. Dr. Daniel E. Morse feels that his chemical mechanism will eventually be used in hatcheries and mariculture lagoons on a large-scale basis, and already it is being put to "semi-commercial" use by a number of California hatcheries. The discovery seems simple enough: hydrogen peroxide is added to alkaline seawater. The chemical seems to activate an enzyme in the reproductive tissues of abalone, and males and females spawn "copiously." Dr. Morse says his team is now working out "barriers" to the application of his discovery to mariculture hatcheries.

HISTORIC PROJECT

The project to salvage the *Bonhomme Richard*, the flag-

ship of John Paul Jones which sank off the Yorkshire coast of England in 1779 (NB, Aug. '76), is being headed by Sydney Wignall, J.M. Stubbs, and Cecil Jones. The first salvage dives to the wreck are planned for 1979, the bicentennial of John Paul Jones' epic battle (in which he cried, "I have not yet begun to fight"). Cecil Jones, staff tutor of the University College of North Wales, wrote that the first dives on the *Bonhomme Richard* would best be done by American personnel and that articles from the wreck would hopefully be retrieved and displayed in the U.S.

UPPING THE TITANIC

Clive Cussler's best selling book, *Raise the Titanic!*, is a novel idea about bringing up the historic ocean liner. Cussler thinks it can be done and he relates his ingenious idea in his book (now being made into a \$15 million film by producer Sir Lew Grade and director Stanley Kramer). In the novel, the motive for raising the *Titanic* is the belief that the only existing supply of a precious metal vital to the defense of the U.S. had been put aboard the ship before it sailed, over 65 years ago. Cussler says that with near-freezing water temperature at 12,000 feet, the ship would be almost perfectly preserved.

Meanwhile, April 15 — the 65th anniversary of the *Titanic* sinking — was celebrated on the *RMS Queen Mary* in Long Beach, Calif., by *Titanic* fans. "Distress rockets" were fired, a 12 piece orchestra played while rememberers danced. Mrs. Edwina MacKenzie, 92,

the only West Coast survivor of the disaster, was on hand to tell her tales. The event helped to fund the Oceanic Navigation Research Society, which is dedicated to researching the golden era (1869 - 1934) of trans-atlantic liners.

MONSTER SULK

Nessie is a lady. Even though it's been suspected for years, it's now been officially stated in Smithsonian by writer Mary Hamman, who says, "Everything points to this: she shows herself only to men, ignoring her own sex, because she knows men are more gullible and likely to take her seriously. No monster wants to be laughed at." Hamman says the reason the New York Times expedition failed to turn up the monster (NB, March) was because the newspaper had printed a "brutal" portrayal about her appearance and failed to identify her sex. "Finding this news not fit to print," writes Hamman, "she sank to the bottom to sulk."

SUHR WRECK

The Society for Underwater Historical Research has been formed in south Australia for the purpose of salvaging and restoring marine artifacts from local waters. A recent find was the steel-hulled clipper ship *Loch Vennachar*, which sank in 1905 on a voyage from Glasgow to Adelaide. SUHR found the wreck 70 miles from Adelaide and last winter began an archaeological survey of the ship. B. Marfleet, who wrote us of the find, added that the expedition will be documented for Australian television.

SAVING DOLPHINS

Save the Dolphins president Stanley Minasian wrote us in March that his San Francisco-based group is working on a solution to the dolphin-tuna problem. It's possible that schools of tuna can be attracted by an artificial dolphin herd, and Minasian says that a

ALL THAT GLITTERS IS NOT THE MARAVILLA . . .

We've had an updated news report on the wreck which was being salvaged off Walker's Key by Robert Abplanalp and a group of divers (NB, March). An article published in the March 14th issue of *Sports Illustrated* was sent to us by the Bahamas News Bureau; it indicated that positive identification of the Walker's wreck had been made by Dr. Eugene Lyon, an authority on Spanish colonial wrecks. Dr. Lyon concluded that Abplanalp's wreck was not the *Maravilla*, but the *San Juan Evangelista*, a frigate which sunk near Walker's Key in November, 1714. The *Evangelista* carried a payload of 300,000 pesos in silver and was headed for Puerto Rico and Santo Domingo when it drifted into the shallows. After it was salvaged, the Spanish burned and scuttled the ship in early 1715.

Abplanalp, who owns Walker's Key, had hoped that his wreck would be the fabulously rich *Maravilla*, a Spanish galleon which sank in 1656 somewhere on the Little Bahama Bank. Bob Marx had said he salvaged part of the *Maravilla* between 1972-75, but Abplanalp still held out hope, saying "It's just as easy to believe that Bob Marx may have found one of the salvage vessels of the *Maravilla*, and not the mother ship herself." (After Marx's 1972 find, a dispute ensued between him and the Bahaman government, and the government suspended his salvage permit. Marx, who says the galleon broke into two sections, says only he knows the location of the main hull and that he's not telling where it is.)

As for the *Evangelista*, Abplanalp had considered raising and restoring it as an exhibit for a university or school of oceanography, but abandoned the idea when he learned that the hull might disintegrate if brought to the surface. So, Abplanalp returned the salvaged cannon to the wreck and the *Evangelista* today is an underwater park for divers to visit.

40 day charter was planned by his group to test devices which would simulate live dolphins. Dolphins and tuna travel together, a fact which has been a bugaboo with the tuna industry, now under the crunch of a restricted quota.

U/W TRAIL

In May, Southern California got its first underwater trail for scuba divers, at White's Point. Seven concrete pedestals were placed on the bottom in 30 ft. of water, connected by a chain. Plaques mounted on each pedestal describe the U/W environment with photos, drawings and descriptive data. Another such trail is being developed off Anacapa Island at the Channel Islands National Monument by the Natl. Park Service.

ANOTHER HOBBY

California senator S. I. Hayakawa, age 70, took his first dive lesson last spring and joined the Congressional Underwater Explorers Club. "It's something I've never done before and it is always good to expand one's horizons," said Hayakawa, who is also engaged in deep sea fishing, harmonica playing, piano, jazz, art collecting, tap dancing, cooking, and semantics.

CHAMBERS FOR NMRI

The Naval Medical Research Institute has gotten its first pressure chambers — a 1000 psig (2250 ft. seawater) wet pot and living chambers. When the institute gets its 1500 psig (3300 fsw) chamber, it will be able to

conduct advanced human hyperbaric research in its own laboratory. A five chamber complex will be "fully operational" in 1979.

CLAM STOPS DREDGE

Last spring, one dead clam stopped a \$281,335 dredging project by the U.S. Army Corps of Engineers. The dredging was being done on the Minnesota River at Savage when a half shell was found that was tentatively identified as *Lampsilis higginsi*, an endangered species of clam. Divers brought up samples to be inspected by a corps biologist, to see if the river bottom was in fact a clam bed. If the clams, commonly called "Higgins Eye," are found, the corps plans an attempt to relocate them.

POPEYES

That New York seafood bistro which we told you about in March — a restaurant that featured fish, singing waitresses and an in-house scuba shop — burned down just after our news item had gone to press. The entire business has been moved to Ocean Beach, Fire Island, New York, and is now called Popeyes.

ODDS & ENDS

Jean-Michel Cousteau recently said that chemical companies cause more pollution than oil firms. Speaking at the Cousteau Awareness Day in Vancouver, Wash., last spring, Cousteau said chemical pollutants are non-visible and therefore attract less attention . . . Dr. William W. Hay, who has served as interim dean of the U. of Miami's Rosenstiel School of Marine and Atmospheric Science, has been named permanent dean of the school . . . NOAA is getting (or has gotten by now) a new director, replacing Robert White . . . Gigi, the Sea World (San Diego, CA) whale who was released from captivity nearly five years ago, was seen in March. She was swimming in a Baja, Calif. lagoon and spotted by an expedition from Whittier College, which recognized Gigi by the big square patch on her back.

READERS ARE INVITED TO SEND ITEMS TO NEWS BRIEFS EDITOR HILLARY HAUSER, 8490 SUNSET BOULEVARD, LOS ANGELES, CALIFORNIA 90069

Among the most spectacular inhabitants of the tropical reef on display for the scuba diver are the many varieties of tiny, brightly colored shrimp. Making up in beauty and delicacy what they lack in size, many of these graceful crustaceans openly and aggressively display themselves, while others are shyly hidden within coral crevices or can be found living unscathed among the enveloping and venomous tentacles of sea anemones, and some may be subtly but effectively camouflaged against the background of anemones or coral hued to match and blend with their own transparent bodies.

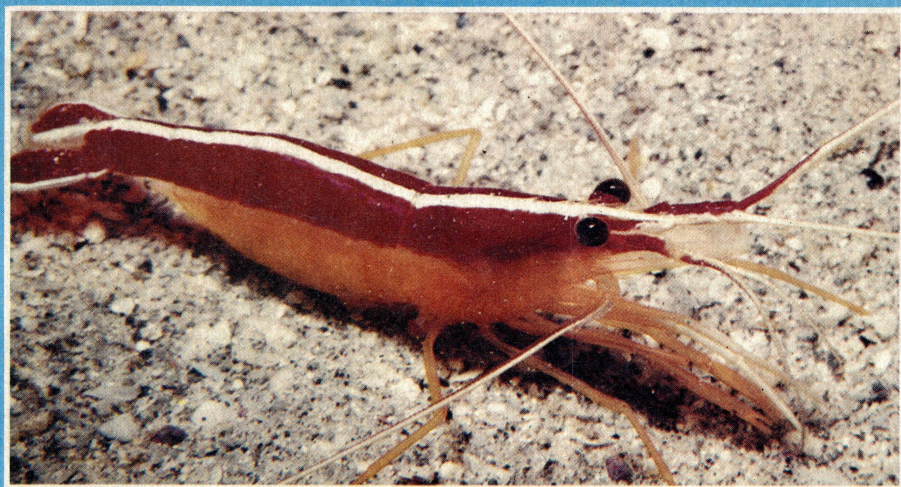
A frequently encountered species is *Periclimenes*, whose body length will not often exceed much more than an inch. One variety, *Periclimenes yucatanicus*, is transparent, except for several distinct, large, white and pinkish-tan saddles or spots often heart-shaped when viewed from above. The legs are banded with violet, purple, red, orange and white. The antennae, longer than the body, are usually red and white. The eggs can be seen in the body cavity of the female as translucent brown. This gaudy beauty was reportedly first observed scientifically in that part of the Caribbean bordering Mexico's Yucatan peninsula.

A close relative of the same family, and of similar size and bearing a close resemblance except for the color pattern, is the purple spotted shrimp, *Periclimenes pedersoni* Chace. Its transparent body can be identified by the longitudinal white lines interspersed with violet spots and patches of various irregular sizes. The forelegs are banded violet, purple and white. It appears somewhat slimmer than *yucatanicus*.

Pedersoni can usually be observed associated with the delicate and sensitive whitish tentacles of the spiral ringed anemone, *Bartholomea annulata*, while both of these species can be found resting on the long, thick arms of the larger, various hued, *Condylactis gigantea*. The observant diver can watch the conspicuous waving of the antennae and the swaying back and forth of the brightly colored body and forelegs as these shrimp signal their willingness to momentarily leave the safety of the stinging tentacles of their anemone hosts to swim to a fish waiting to be cleaned.

These shrimp will board the fish as soon as it is close enough, and, moving rapidly, will remove tiny parasites, clean open wounds, and even pick food particles from the teeth and gills of the fish. If the observing diver moves in too close, the shrimp either swims away or is ejected before the fish retreats. Both are territorial and often remain for weeks or months on or near the same anemone.

Not as easily observed is *Periclimenes rathbunae*, a somewhat smaller shrimp



Lysmata grabhami

SHRIMP

The spectacular inhabitants
of a tropical reef

By Dick Harrison

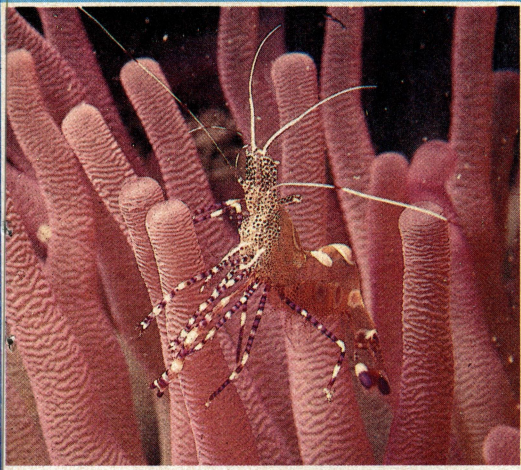
almost indistinguishable in color from its host, and usually found nestled deep in the top center of a tan cluster anemone with short, stubby, knoblike arms. Small reddish-brown spots form bands on the legs and patterns on the otherwise transparent body. There is little perceptible movement and this shrimp is so tiny that it may easily be overlooked. The diver must concentrate all of his attention and must look very closely to find this specimen.

One possible aid to the location of *P. rathbunae* is to find the even tinier, but more distinctly colored, shrimp with the powerful sounding name of *Thor ambloinensis*. Brown and white, sporting what appears to be a luxuriant growth of whiskers, with its tail raised high, little *Thor* has a truly distinctive appearance. Several, or an entire family group, may be seen together at the base of the anemone where *P. rathbunae*, almost invisible, lies perched on top. *Thor* is probably not a fish cleaner, although it may function to remove detritus from the anemones with which it is associated. The diver can often also find *Thor* near the base of several varieties of the *Condylactis* anemone.

Lysmata rathbunae is a beautifully multi-hued, bright, red-veined shrimp named after the Queen of the Amazon in Greek myth. This brilliant carmine striped species may exceed two inches in length, and can be found living in sponges, usually in depths of 40 to 160 feet. Though little is presently known concerning it, scientists suspect that this variety may also function as a cleaner.

Its close relative, *Lysmata grabhami*, often called the scarlet lady, is of similar size, but is most often found in fairly shallow water, less than 30 feet deep. Its color is yellow ochre with a broad, red, longitudinal band bisected by a white stripe the entire length of its back, the white stripe also outlining the tail. Its white antennae are lashed vigorously in the presence of fishes to attract attention. This red-backed cleaner shrimp can often be observed in pairs and it favors large, shaded, coral crevices, which it will temporarily leave to pursue its cleaning activities in direct contact with fishes and moray eels. If the diver is alone with this cleaner and carefully places his hand nearby, he may feel a series of sharp pin pricks as the scarlet lady searches for particles under the fingernails and over

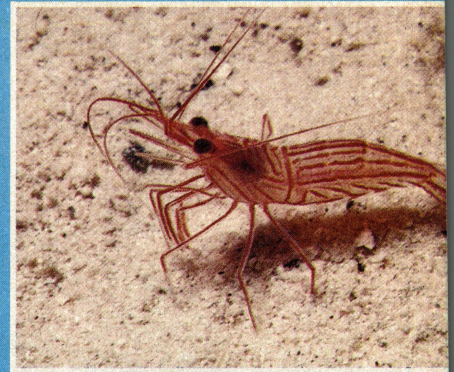
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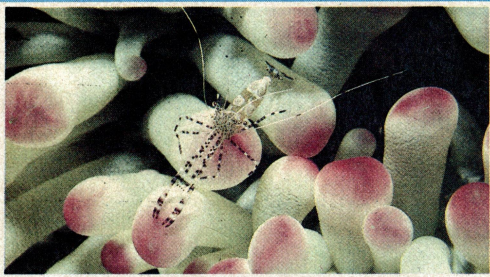
Periclimenes yucatanicus



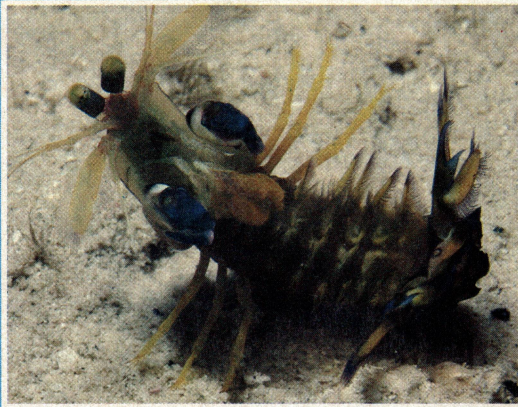
Thor amboinensis



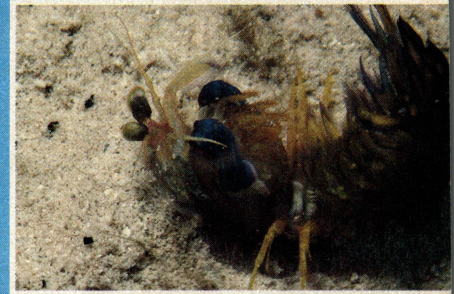
Lysmata rathbunae



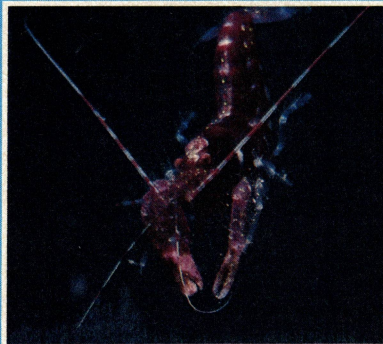
Periclimenes yucatanicus



Gonodactylus curacaoensis



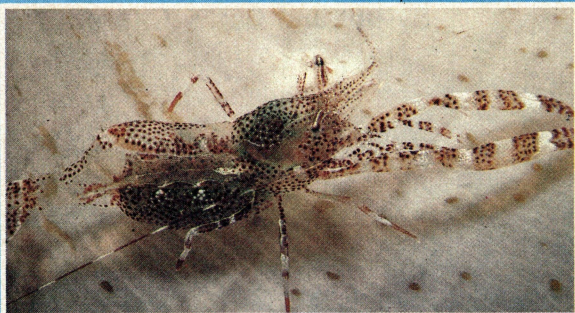
Alpheus armatus



Rhynchocinetes



photography by Author



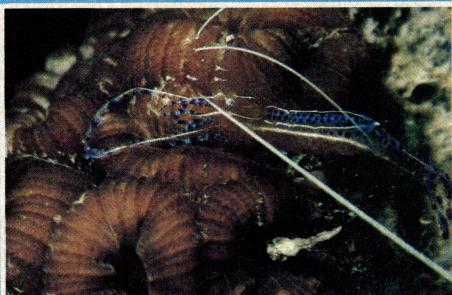
Periclimenes rathbunae



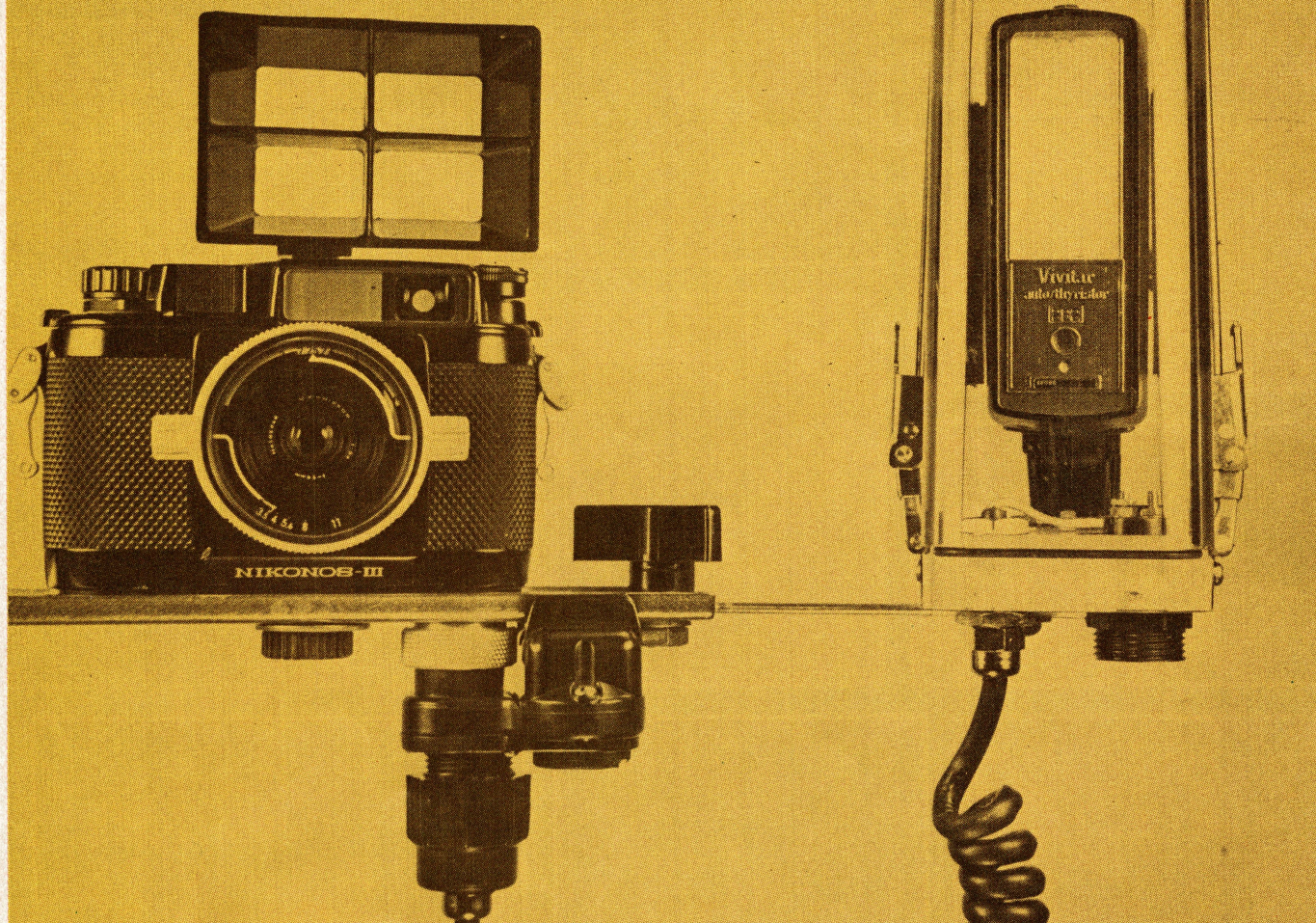
Periclimenes rathbunae



Stenopus hispidus



Periclimenes pedersoni Chace



The Ikelite SST System

SDM PRODUCT REVIEW

By Jim and Cathy Church

The Ikelite SST (solid state triggering) System represents a major effort to ensure that strobes in Ikelite housings will flash when the camera shutter is triggered. In the past, the Ikelite connector system depended on the strobe to power the electrical circuit from strobe to camera and back. However, with wet connections and long sync cords, the strobe frequently couldn't supply enough current to complete the circuit. Now, with the new SST System, this problem has hopefully been solved.

HOW THE SYSTEM WORKS

Let us explain how the new SST System works in the simplest manner:

1. A 22½ volt battery and capacitor are located near the camera. The electrical energy in the battery flows to the capacitor where it accumulates.
2. When the camera shutter is trig-

gered, the accumulated energy in the capacitor is released to trigger the SST device inside the strobe housing which causes the strobe to flash.

Basically, this system provides the extra "push" to get through wet, underwater connections that above water strobes weren't designed to cope with.

HOUSED CAMERAS

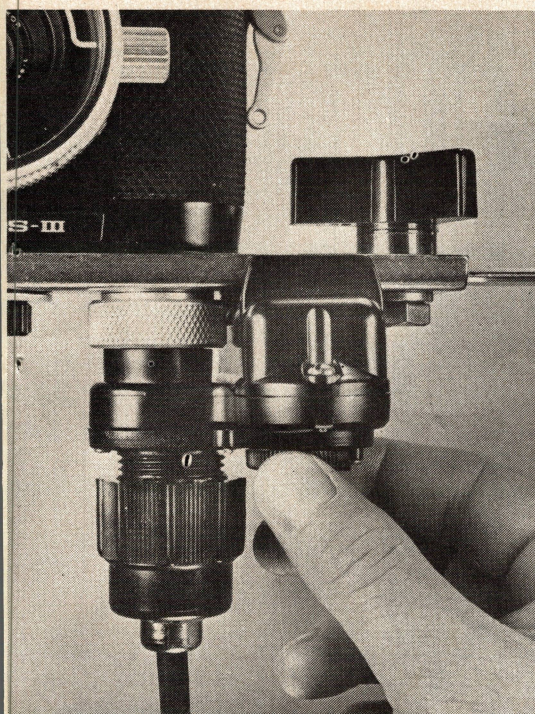
Many of the latest Ikelite camera housings — such as the various models of the SLR case — have a capacitor and a battery holder built into them as standard equipment. Likewise, the SST triggering device is built into the strobe housings as standard equipment. All you have to do is insert a 22½ volt battery (Ray-O-Vac, No. 221 or equivalent) into the battery holder and attach the ICS (Ikelite Connector System) plug on the strobe sync cord to the bulkhead connector on the

housing. The battery/capacitor in the housing can also be used to fire Ikelite flashbulb and flashcube systems, but don't forget to change the synchronization setting on the camera from X to M if you switch to bulbs or cubes.

One small precaution: If your camera has rings for attaching an above water neck strap, the left one may have to be taped in place or removed. With some cameras, this ring can swing out and make contact with the battery holder when the camera is turned on its side for a vertical picture format. If the strobe is recycled, this can cause the strobe to flash. If the strobe is still recycling when the ring makes and holds contact with the battery holder, the strobe will not flash when the shutter is released.

IKELITE NIKONOS POWER PACK

The Nikonos Power Pack is actually a



Above: A three position switch at the bottom of the Power Pack has various settings. Above and center right: The Power Pack is a miniature housing for the battery and capacitor. Right: The SST device is on a circuit board just below the hot shoe in a strobe housing, or may be incorporated into the PC cord inside the housing.

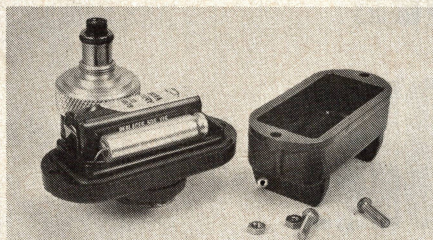
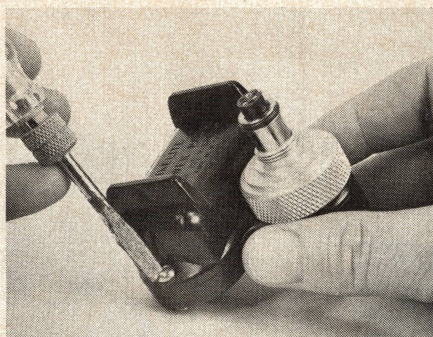
miniature housing for the battery and capacitor. The top of this housing is fitted with a Nikonos connector, and the bottom with an Ikelite bulkhead connector. A three-way switch at the bottom of the Power Pack has settings for: BC On, M Sync, for use with the Ikelite #4023 bulb flash or #4033 cube flash; BC On, X Sync, for use with housed strobes and the SST triggering device; and BC Off, X Sync, for use with older model Ikelite housings without the SST System.

Because the Nikonos Power Pack is the most complicated part of the system — in terms of user maintenance and operation — let's look at the steps necessary to get it into operation:

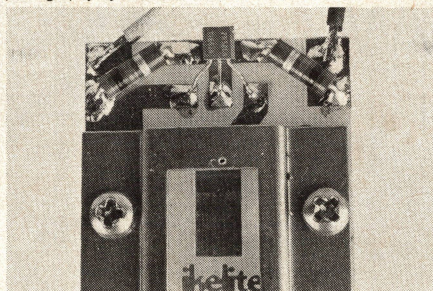
1. Remove the two screws which hold the cover of the Power Pack in place and lift this cover off. You can now see the battery holder, capacitor and O-ring. Replacing batteries and cleaning the O-ring are the only internal maintenance jobs you will need to do.

2. To clean the O-ring, use both thumbs — pushing on the O-ring from opposite sides — to cause the O-ring to bulge at one of the corners. Grab the bulge with your fingers and lift the O-ring out of its groove. Remove any sand or dirt from the O-ring and groove with a soft cloth. Lubricate the O-ring with a small amount of silicone grease applied with your fingertips — remember: just a little!

3. To replace the O-ring, press it into



photography by Authors



its groove with your fingertips. Then, place the compartment cover over the O-ring and squeeze it into place with finger pressure to seat the O-ring firmly in its groove. Remove the cover.

4. Use a rough cloth to rub the inner surfaces of the battery holder contacts, and both ends of the battery, to remove any invisible oxides that could impede the flow of current.

5. Insert the battery in its holder. Double check that the ends of the battery are contacting the appropriate terminals.

6. Check that the sealing surface of the compartment cover is clean, and then fit it in place and secure it with the two screws and nuts. Be sure that the notch in the outside of the cover faces away from the Nikonos connector on top of the Power Pack.

7. Place the Ikelite Tray in position first, then attach the Power Pack to the camera. Make sure that the side marked Front is facing the front of the camera, and be careful to insert the Nikonos connector so that it makes proper contact with the terminals inside the Nikonos flash socket. The threads and O-ring of the Nikonos connector should be coated with a thin film of silicone grease, and screw the connector in carefully so that it doesn't cross-thread with the Nikonos flash socket.

8. Lastly, plug the ICS plug into the bulkhead connector of the Power Pack

and tighten the retaining ring with firm but gentle finger pressure. Note that the ICS plug fits on only one way — the screw protruding from the plug fits into a hole in the Power Pack. This is to ensure correct polarity when the connection is made. If the fit of the ICS plug is loose, the prong tips can be spread with a screwdriver blade.

After the system has been assembled, set the selector switch for the proper mode and test flash your strobe.

THE STROBE HOUSING

The only modification to the strobe housing is that the SST device and a pair of resistors are installed inside. With our housing for the Vivitar 292, these electronic parts are soldered to a small printed circuit board which is located just below the hot shoe strobe mounting. In some other housings, these electronic parts are sealed underneath heatshrink tubing in the PC cord. The important point is: the battery/capacitor system requires the SST device to be inside the strobe housing. If you have an older Ikelite strobe housing (prior to 1977), you can have the device installed for \$10.

TESTING THE SST SYSTEM

Our test equipment consisted of a Vivitar 292 with an Ikelite strobe housing, a Nikonos III with Nikonos Power Pack, and a Nikon F in an Ikelite SLR Case. The testing procedure was as follows:

1. We began by assembling and disassembling the system — using both the Nikonos and Nikon — to see if we could find design faults which would affect the ease of operation. We found that it was easy to assemble and use. However, as the Nikonos Power Pack is a miniature housing, the O-ring seal must be cleaned and lubricated.

2. The next step was to test flash the strobe in air several times with both camera systems. We didn't experience any misfires.

3. Freshwater testing was next. Using both camera systems, the Vivitar 292 was flashed several times while submerged in our 20 gallon test tank. The ICS plug was detached and reattached underwater several times. Again, we had no misfires.

4. The final test was made 40 feet underwater in Monterey Bay, Calif. We shot 36 exposures with the Nikonos and 36 with the Nikon, with the ICS plug being transferred from one camera to the other while underwater. We had no misfires.

Conclusion: The Ikelite SST System passed the tests described above with flying colors!

FOR MORE INFORMATION

To learn more about the Ikelite SST System, visit your local dive shop, or contact Ikelite directly. Send \$1 to Ikelite, 3303 North Illinois St., Indianapolis, Ind. 46208, for a catalog of the company's U/W photographic products.

THE Farallon Hydrocom

Breaking the U/W Sound Barrier

SDM PRODUCT REVIEW

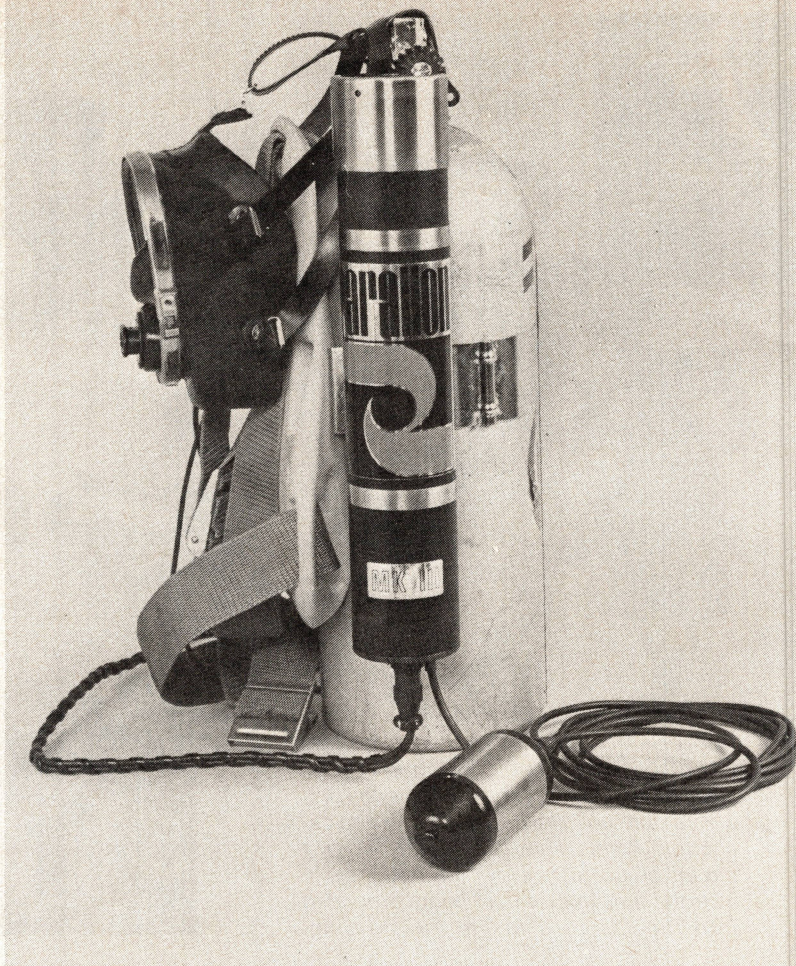
By Jim Hall

1977 will go down in history as the year the CB radio craze reached its peak and spilled over into the oceans. A change is taking place all around the country — charter boats are becoming sophisticated base stations to support sport divers who are being transformed into sea-roving mobile units. Scuba diving may never be the same. Once a silent sport, it has now become a shared experience for its participants thanks to the technology of Farallon's new Hydrocom.

Underwater communication technology has been asleep since the sport of diving began and, in terms of innovation, the Hydrocom could be as significant to the evolution of diving as the introduction of the self contained underwater breathing apparatus. In the past, attempts to develop reliable ways of speaking both to and between divers underwater have generally been limited, with varying degrees of success, to variations of sound-generating devices. Sonic, or ultrasonic, communication can be quite good, given specific environmental conditions. However, interference abounds in the form of sound-reflecting rocks and thermoclines, cavitating propellers, noisy fish and signal-soaking kelp. The sea is a fickle world and conditions are rarely perfect for sonic transmission.

Farallon's approach to diver communication, a modulated electrical field generated between two electrodes, avoids most subsea environmental problems. This solution has its limitations, too — notably cost and size. But, if you are willing to accept them as the price you have to pay to speak reliably underwater, you will find that the Hydrocom works surprisingly well.

The Farallon Hydrocom is a result of a 19th century experiment by Samuel Morse and the 20th century needs of the U.S. Navy. During research into underwater communication, sensing and defense systems, Farallon's vice president of research and development, Norm MacLeod, tried to find a way to apply

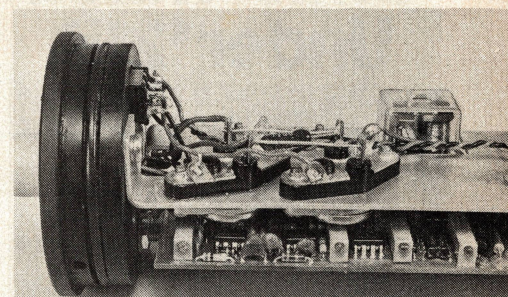
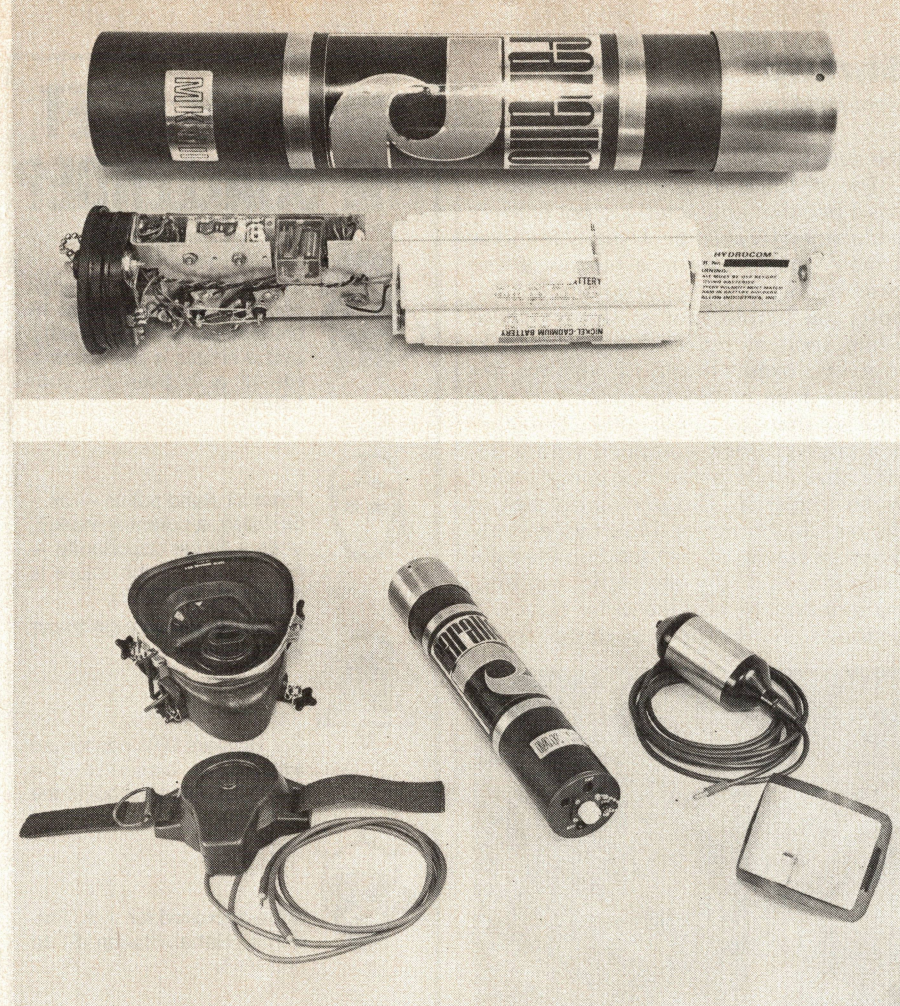


Morse's experiment to ward off sharks, detect enemy frogmen and talk underwater. Although those lines of innovation did not produce the all-around unit that the Navy wanted, MacLeod hit upon the idea of adding a short antenna and voice modulating the electrical field for communication. The result is a compact tube that measures 15.75 by 3 inches, weighs approximately 1.25 pounds in the water and has a ten-foot long, floating antenna.

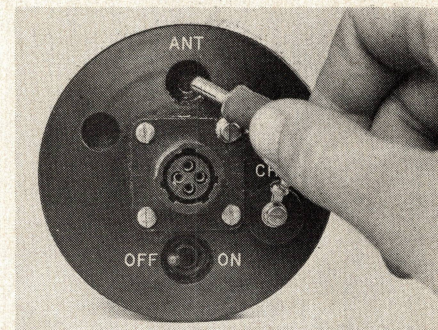
All three underwater models of the Hydrocom clamp to the right side of your tank. The MK I uses 16 alkaline C cells to generate 10 watts of output, with a range of 100 feet between divers and a continuous transmission time of 20 hours. The MK II has the identical output and range, but uses the far more economical nickel-cadmium rechargeable batteries and has a continuous transmission time of eight hours. Given the rising costs of everything these days, we recommend that sport divers sacrifice a little transmission time and get the Hydrocom MK II with the rechargeable batteries.

For commercial divers, Farallon produces another rechargeable model, the Hydrocom MK III. Containing the same nickel-cadmium batteries as the MK II, the MK III has a 40 watt output, 200 foot range, with four hours of battery life. With the Hydrocom surface unit, a totally adaptable, custom-made unit, a \$1,500 option for dive boats or oil rigs, the MK III can be interfaced with commercial "hard-wire" telephone systems or customized at the factory to provide remote telemetry of the diver's depth and air pressure as required by recent OSHA regulations. Tape recorders, radio transmission and loudspeakers can also be added to the surface unit.

The MK I, MK II and MK III function identically. The microphone is housed in a variety of full face masks, such as those available from Desco, AGA Divator, or U.S. Divers. Muzzle masks may also be used. Transmission is initiated



photography by Geri Murphy



Hydrocom uses a sophisticated transistor circuit to convert voices from electrical fields to sound. At left are; a full face mask, and optional pool training speaker, the Hydrocom, a floating antenna and an optional ankle clamp.

through the use of a two-stage voice operated relay, or VOX. The owner presets the VOX circuit's threshold to his or her individual voice characteristics. Stage one of the relay is triggered by the use of a forcefully spoken key throwaway word like "hey," "ahh," or "hi." The preset VOX eliminates accidental transmission during moments of heavy breathing or by exhaust bubbles. Once the key word has been spoken, the diver completes his message in a normal voice. Approximately one second after ending a transmission, the Hydrocom automatically reverts back into a receiving mode.

By using a sophisticated transistor circuit, the Hydrocom converts voices from electrical fields to sound. The design of the receiver circuit incorporates an automatic gain control (AGC) so that no matter how distant the receiver is, the signal being transmitted to him is boosted to the proper hearing level.

The earphone is an encapsulated bone conduction speaker that slips under the wet suit hood and rests on the mastoid bone behind the user's right ear. Small and unnoticeable, this compact earphone produces telephone-quality sound.

Reception and range are facilitated by the use of a "floating antenna." Actually, it is an extended electrode with the ground end being the case of the unit. When properly extended to its full ten feet, the Hydrocom's antenna will generate an electrical field that can be sensed as far as 200 feet away from another diver. Stowed around the case, the antenna will give you 20 feet of range. If accidentally lost, the unit still works well without the antenna up to ten feet from another unit. For wreck diving, Farallon provides an accessory ankle clamp that straps the antenna the length of a diver's body, which can produce about 60 feet of effective transmission.

Although towing a ten-foot long, floating antenna behind us during a dive sounded a bit ridiculous, in practice it posed no special problems. It helps to keep the wire loosely coiled in

one hand during boat entries and deploy it after submerging, to prevent catching it under your tank. We cruised through numerous patches of kelp during open-water testing and never once did the antenna snag. In the unlikely event that your antenna should get caught, the Hydrocom has a break-away feature at its base which releases with a firm tug. When using the leg electrode accessory, we noticed a drop in range and an increase in the directional characteristics of the units. Because the Hydrocom generates an electrical field, there is a slight tingling shock that can be felt when holding either electrode with bare hands during transmission.

How well does the Hydrocom work? After testing in the carefully controlled environment of Marineworld Africa USA near San Francisco, and again in open-water conditions off Southern California, we are sure Farallon has a winner. We field tested both the MK II and MK III models and their performance was impressive. The units were well finished, worked flawlessly and met every claim made by the manufacturer.

The joy of being able to talk to your buddy changes the whole nature of the dive experience. Whether you are just a beginner, or an experienced mossback, it is something you should make every effort to experience. And it is not hard to imagine what the Hydrocom can do for training beginning divers. Being able to lead students through their water skill sessions with a calm voice will greatly reduce their anxieties. Farallon is aggressively pioneering this application of Hydrocom with an optional pool speaker attachment and a miniature open water receiver for students. But whether teaching or not, the Hydrocom makes diving much more fun.

The silence has been broken once and for all. The Hydrocom is here to stay. If you are serious about enjoying diving, we recommend that you give investing in a set of these units consideration. 

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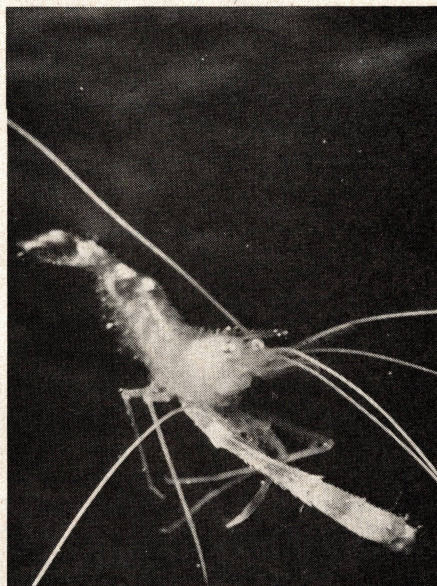


Shrimp

(Continued from Page 61)

the surface of the skin.

The pistol shrimp *Alpheus armatus*, has a peculiar characteristic not entirely understood by science. Usually found as a mated pair living in a burrow at the base of the same spiral anemone that hosts the purple spotted shrimp, these white spotted, red or burgundy, strikingly colored, snapping shrimp are equipped with two formidable claws. One is a sharp pincer or cutter. The other is a large crusher, equipped with a device that emits a loud popping sound when triggered. The peculiarity lies in the fact that either of these two entirely different claws can be found on the right or on the left of any one of these shrimp, male or female, and the other claw will be found on the other side of that speci-



Stenopus scutellatus

men. Its mate can have the same or a reversed claw arrangement. Under investigation is the belief that if the large claw of this aggressive shrimp is lost, then the pincer claw may assume the form of the crusher claw during the following or a succeeding molt, and the missing side will generate a new pincer claw to replace the lost crusher.

Though *Alpheus* may advance to attack and sound an alarm to any intruder when danger comes near, it may as quickly withdraw and plug the entrance of its burrow when the ringed anemone contracts. The loud "bang" heard by the diver originates from a shock wave caused by a "firing pin" that fits snugly into and slips out of a socket on the crusher claw when it is forcefully opened and closed.

Two other colorful cleaner shrimps similar in appearance to each other and closely related are *Stenopus hispidus*, the barberpole shrimp, and *Stenopus scutellatus*, commonly called the golden coral shrimp. *Hispidus* can be well over

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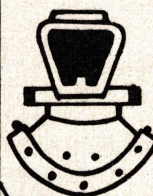
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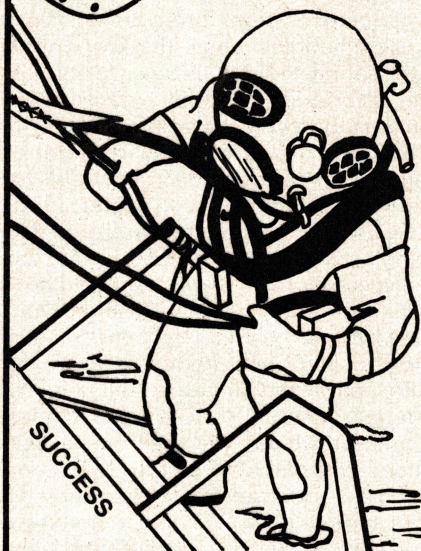
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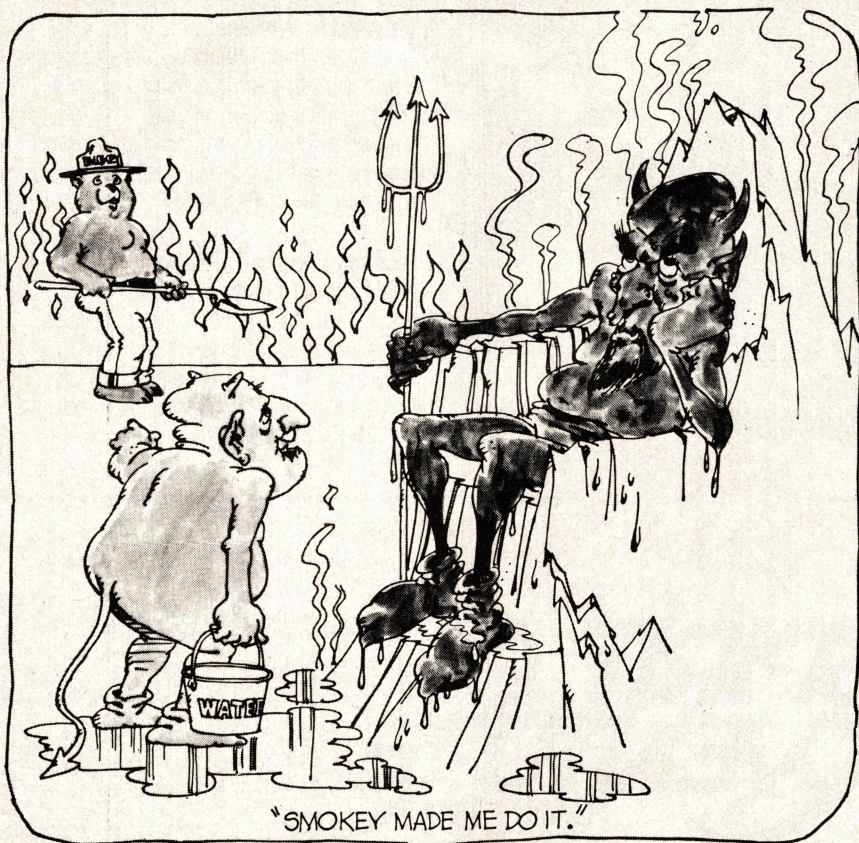
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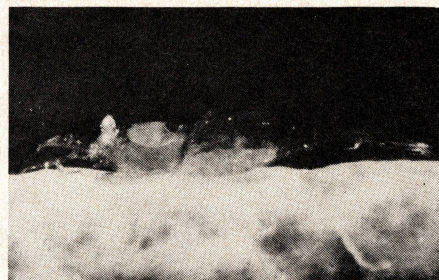


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Shrimp

(Continued from Page 66)



Pontonides

two inches overall, and is the largest of the known cleaner shrimps. Its body and legs are white with bands of red, except that the legs of large adults are blue. The cluster of eggs carried by the female is turquoise. Though its body may be hidden in the shade of a coral crevice, its white antennae are usually clearly and visibly displayed in the sunlight. Juveniles appear to pair and grow up together.

Stenopus scutellatus may attain a body length of about one inch. Its back is lemon yellow, although its general color pattern and structure, pairing, and living patterns, are otherwise similar to *S. hispidus*. Both of these shrimp accomplish cleaning by partially remaining in their crevices and reaching out with their claws, rather than jumping onto and crawling over the body of a fish or eel. These two shrimp seem to have fixed abodes where their finned customers can find them, day after day.

One of the tiniest shrimp that can still be seen by the diver with sharp eyesight, and photographed by using a lifesize, or greater, magnification extension tube and framer set-up on the Nikonos camera, is a species of *Pontonides* that lives on certain gorgonians and on wire coral, a form of black coral identified as *Virgularia*. Resting almost immobile and virtually invisible, this tiny creature is less than one-eighth of an inch in length.

Near the other end of the size scale is the mantis shrimp, which is not a cleaner, but which is a species often well over three inches in length and which is capable of attack by utilizing a pair of strong and sharp specialized mouth parts. The blue-clawed mantis, *Gonodactylus curacaoensis*, is a beautiful creature, rightly endowed in shades of yellow, green and blue. It is a formidable predator that may dig a burrow in the sand, positioning itself to shoot its specially adapted lower jaws snapping upward beneath its prey.

A rarely seen, and seldom photographed, brilliantly red-colored shrimp usually associated with very deep water, but which has recently been found in a coral cave at about 20 feet at night, off San Salvador in the Bahamas, has been tentatively identified as belonging to the genus *Rhynchocinetes*. Its blue eyes are

luminescent and several specimens were observed hanging upside-down, apparently feeding on the green algae growing on the roof of the cave. This shrimp was not seen during the day when the cave was inhabited by royal grammas, squirrel fish, snapper, and groupers, but was probably safely hidden from view in crevices of the coral. It is not known to be a cleaner, and would probably have served as food for the fishes had it ventured forth during the day.

The diver-photographer will find that his Nikonos camera with extension tube and framer, equipped with an electronic strobe, will be ideal for obtaining photographs of these tropical reef shrimp.

One photographic technique is to carefully isolate the individual shrimp from its normal home to a clear area of sand at least ten feet distant. The shrimp usually becomes sufficiently confused and disoriented from having lost its familiar surroundings so that it will become still and may pose and preen to attract the attention of the photographer, enabling the accurate positioning of the shrimp within the extension tube framer. It is also possible, usually with the aid of your dive buddy, to swim the shrimp upward from the sea floor a dozen feet or more, release it, and frame-photograph it as it executes movements ranging from ballet to rapid swimming with its legs and contractions of its muscular tail.

A word of caution! Be watchful that there are no curious fish in the area to dart in and swallow your model. And be sure to place the shrimp back in the protection of its own familiar environment after you have your pictures.

These shrimp are only a few of the many of their species that can be found in the warm waters off Florida, the Caribbean, and the Bahamas. Where the cleaners among them are present, the reef seems capable of supporting an abundance of healthy anemones, corals, and fish. Though man may not always fully appreciate and understand the purposes of nature, each of these many shrimp that can be encountered by the roaming diver has its own place in the life scheme of the tropical reef.

SSI Expands Staff

Bob Clark, executive director of Scuba Schools International, has announced that SSI has expanded its headquarters staff. Steve Linton, former general manager of Midwest Divers Supply and Schools, and former investigator with the Larimer County, Colorado Sheriff's Department, has joined SSI as director of education. Linton is also director of the Larimer County Underwater Search and Rescue Team.

Jim Elliott, former director of education of SSI and former director of economic development for the City of Louisville, Kentucky, becomes director of administration and development.



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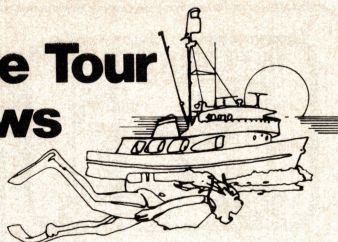
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Dive Tour News



- July 1—LAS GATAS/ZIHUATANEJO, MEXICO—6 week teenage camp, Owen Lee, New York
- July 1, 8, 15—CAYMAN—4 days, Bob Larson, Little Cayman Adventures, St. Petersburg, FL
- July 1, 8, 15, 22, 29—FLORIDA—3 days, Dive Florida Tours, Jacksonville, FL
- July 1, 8, 15, 22, 29—HAITI—8 days, Oceaneers Dive Tours, Inc., Hollywood, FL
- July 1, 8, 15, 22, 29—FLORIDA—3 days, Dive Florida Tours, Jacksonville, FL
- July 1, 8, 15, 22, 29—BONAIRE—8 days, Lisind Int'l, New York, NY
- July 1, 8, 15, 22, 29—BONAIRE—8 days, World Wide Divers, Inc., New York, NY
- July 2—TRUK/PONAPE—9 days, See & Sea Travel, Inc., San Francisco, CA
- July 2—TRUK LAGOON, MICRONESIA—12 days, See & Sea Travel, Inc., San Francisco, CA
- July 2—CAYMAN ISLANDS—7 days, Ron Merker, See & Sea Travel, Inc., San Francisco, CA
- July 2—BELIZE BLUE HOLE—8 days, Hank Silver, Dallas, TX
- July 2, 9, 16, 23, 30—GRAND CAYMAN—8 days, Lisind Int'l, New York, NY
- July 2—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN
- July 2, 9, 16, 23, 30—M/S SOUTHWARD—U/W Adv. Assoc. 312-286-7855
- July 2—VIRGIN ISLANDS—12 days, Trimaran Misty Law, St. Thomas, VI
- July 2—SAN SALVADOR, BAHAMAS—8 days, Tri-City Divers, Vernon, CT
- July 2—TRUK, MICRONESIA—13 days, See & Sea Travel, Inc., San Francisco, CA
- July 2—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
- July 4, 11, 18—CAYMAN—5 days, Bob Larson, Little Cayman Adventures, St. Petersburg, FL
- July 6—GALAPAGOS ISLANDS—18 days, Paul Humann, See & Sea, San Francisco, CA
- July 9—VIRGIN ISLANDS—8 days, Carl Roessler, Sea & Sea Travel, San Francisco, CA
- July 9—BONAIRE—7 days, Peter Capen, See & Sea Travel, Inc., San Francisco, CA
- July 9—ST. THOMAS—7 days, The Scuba Shoppe, Stratford, CT
- July 9—ANDROS, BAHAMAS—7 days, Fred Calhoun's Underwater Safaris, Boston, MA
- July 9—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
- July 9—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA
- July 10—BIMINI/NASSAU—10 days, Adventure Cruises, Ft. Lauderdale, FL
- July 11—BIMINI—7 days, Capt. Tom Guarino, Dive Boat Annie-Up, Key Largo, FL
- July 12—TOBAGO—7 days, Neptune Equipment Co., Nashville, TN
- July 16—VIRGIN ISLANDS—8 days, Angelo Festa, See & Sea Travel, San Francisco, CA
- July 16—COZUMEL—7 days, James Wilson, See & Sea Travel, Inc., San Francisco, CA
- July 16—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN
- July 16—ST. THOMAS—8 days, Go Diving, Inc., Minneapolis, MN
- July 16—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA

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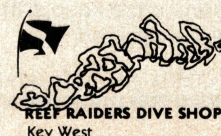
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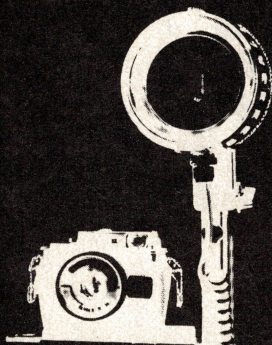
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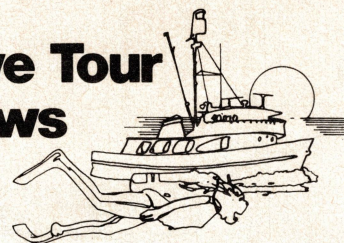
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- July 22—FIJI—9 days, Poseidon Ventures, Tours, Newport Beach, CA
- July 23—HAWAII—8 days, Go Diving, Inc., Minneapolis, MN
- July 23—BELIZE—7 days, Go Diving, Inc., Minneapolis, MN
- July 23—SAN SALVADOR—8 days, Columbus Landing, Ft. Lauderdale, FL
- July 23—VIRGIN ISLANDS—12 days, Trimaran Misty Law, St. Thomas, VI
- July 24—BIMINI—7 days, Adventure Cruises, Ft. Lauderdale, FL
- July 30—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
- Aug. 5, 12, 19, 26—FLORIDA—3 days, Dive Florida Tours, Jacksonville, FL
- Aug. 5, 12, 19, 26—HAITI—8 days, Oceaneers Dive Tours, Inc., Hollywood, FL
- Aug. 5—GREAT EXUMA—14 days, Adventure Cruises, Ft. Lauderdale, FL
- Aug. 5, 12, 19, 26—BONAIRE—8 days, Lisind Int'l, New York, NY
- Aug. 6—TRUK/PONAPE—9 days, See & Sea Travel, San Francisco, CA
- Aug. 6—TRUK LAGOON—12 days, Rick Tegeler, See & Sea Travel, Inc., San Francisco, CA
- Aug. 6, 20, 27—BELIZE BARRIER REEF—8 days, Hank Silver, Dallas, TX
- Aug. 6—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
- Aug. 6, 13, 20, 27—M/S SOUTHWARD—U/W Adv. Assoc., 312-286-7855
- Aug. 6—TRUK/PALAU—21 days, Lisind Int'l, New York, NY
- Aug. 6, 13, 20, 27—GRAND CAYMAN—8 days, Lisind Int'l, New York, NY
- Aug. 6—VIRGIN ISLANDS—12 days, Trimaran Misty Law, St. Thomas, VI
- Aug. 6—TRUK, MICRONESIA—13 days, See & Sea Travel, Inc., San Francisco, CA
- Aug. 8—BIMINI—7 days, Capt. Tom Guarino, Dive Boat Annie-Up, Key Largo, FL
- Aug. 10—GALAPAGOS ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
- Aug. 12—BONAIRE—8 days, DeMarco & LeClair Travel, Medford, MA
- Aug. 13—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN
- Aug. 13—FREEPORT—8 days, Go Diving, Inc., Minneapolis, MN
- Aug. 13—FLOWER GARDENS—2 days, Diver's World, Richardson, TX
- Aug. 13—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
- Aug. 20—COZUMEL—7 days, Hugh Parkey, See & Sea Travel, Inc., San Francisco, CA
- Aug. 20—BONAIRE—7 days, Norine Rouse, See & Sea Travel, Inc., San Francisco, CA
- Aug. 20—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
- Aug. 20—BELIZE—7 days, Go Diving, Inc., Minneapolis, MN
- Aug. 20—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
- Aug. 20—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA
- Aug. 23—GREAT EXUMA/NASSAU—7 days, Adventure Cruises, Ft. Lauderdale, FL

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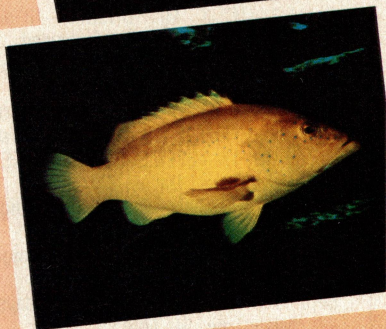
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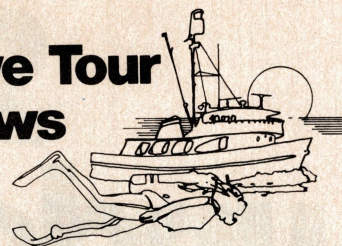
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Dive Tour News



- Aug. 26—FIJI—9 days, Poseidon Ventures Tours, Newport Beach, CA
- Aug. 27—VIRGIN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
- Aug. 27—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN
- Aug. 27—HAWAII—7 days, Go Diving, Inc., Minneapolis, MN
- Aug. 27—VIRGIN ISLANDS—12 days, Trimaran Misty Law, St. Thomas, VI
- Sept. 2, 9, 16, 23, 30—FLORIDA—3 days, Dive Florida Tours, Jacksonville, FL
- Sept. 2, 9, 16, 23, 30—HAITI—8 days, Oceaneers Dive Tours, Inc., Hollywood, FL
- Sept. 2, 9, 16, 23, 30—BONAIRE—8 days, Lisind Int'l, New York, NY
- Sept. 3—TRUK/PONAPE—9 days, See & Sea Travel, San Francisco, CA
- Sept. 3—TRUK LAGOON—12 days, John Kelly, See & Sea Travel, Inc., San Francisco, CA
- Sept. 3, 10, 17, 24—GRAND CAYMAN—8 days, Lisind Int'l, New York, NY
- Sept. 3, 10, 17—M/S SOUTHWARD—Underwater Adventurers Assoc., 312-286-7855
- Sept. 3—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
- Sept. 3—BELIZE—7 days, Go Diving, Inc., Minneapolis, MN
- Sept. 3—TRUK, MICRONESIA—13 days, See & Sea Travel, Inc., San Francisco, CA
- Sept. 4—NASSAU/BIMINI—10 days, Adventure Cruises, Ft. Lauderdale, FL
- Sept. 10—CAYMAN/ROATAN—12 days, Jerry Jones, See & Sea Travel, San Francisco, CA
- Sept. 10, 17—BELIZE BARRIER REEF—8 days, Hank Silver, Dallas, TX
- Sept. 10—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN
- Sept. 10—HAWAII—8 days, Go Diving, Inc., Minneapolis, MN
- Sept. 10—VIRGIN ISLANDS—12 days, Trimaran Misty Law, St. Thomas, VI
- Sept. 10—CAYMAN/ROATAN CRUISE—12 days, See & Sea Travel, Inc., San Francisco, CA
- Sept. 11—FLORIDA KEYS—6 days, Black Magic Dive Shop, Mundelein, IL
- Sept. 17—COZUMEL—7 days, See & Sea Travel, Inc., San Francisco, CA
- Sept. 17—BONAIRE—7 days, See & Sea Travel, Inc., San Francisco, CA
- Sept. 17—VIRGIN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
- Sept. 17—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
- Sept. 17—ST. THOMAS—8 days, Go Diving, Inc., Minneapolis, MN
- Sept. 17—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
- Sept. 17—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA
- Sept. 23—FIJI—9 days, Poseidon Ventures Tours, Newport Beach, CA
- Sept. 24—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN
- Oct. 1—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
- Oct. 1, 8, 15, 22, 29—GRAND CAYMAN—8 days, Lisind Int'l, New York, NY



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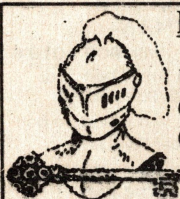
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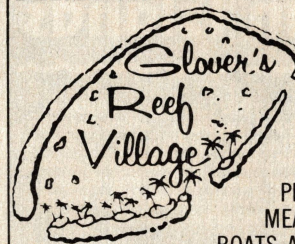
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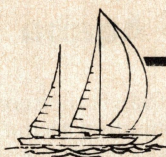
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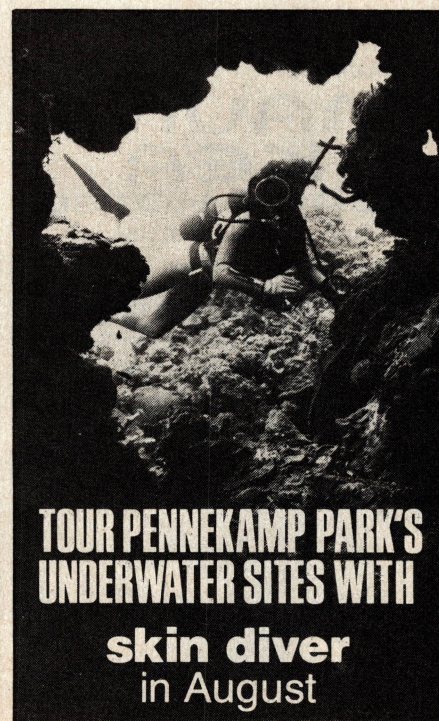
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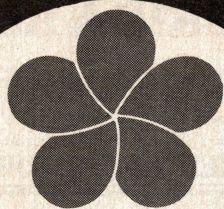
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See & Sea To Aqaba Red Sea

See & Sea Travel, Inc. of San Francisco has announced its fall departure to the Red Sea. This program is in its third year.

The program includes all accommodations, meals, tanks, backpacks and weights, with chartered local fishing boats as the base for unlimited diving. In addition, the programs offer a trip to Wadi Rum (the desert fortress of Lawrence of Arabia) and a full-day excursion to the lost city of Petra, the "rose-red city half as old as time."

The coral gardens of Aqaba feature a wealth of soft and hard corals, tropical reef fish and large pelagic species. Of particular interest are the vast numbers of lion fish and the crocodilefish.

Carl Roessler will escort the October 8-22 program. For further information, contact See & Sea Travel Service, Inc., 680 Beach Street, #340, San Francisco, California 94109.

New Charter Cruiser In Cayman

Prairie Schooner II, a new 55 foot twin diesel cruiser, is now available on a charter basis for diving in the Cayman Islands. She is one of the few such vessels in Cayman involved in chartering and can be booked directly through Surfside Water Sports, P.O. Box 26, Grand Cayman, B.W.I., or the North American representative, Richard Bertram and Co., Box 3068 Bahia Mar, Fort Lauderdale, Florida.

Prairie Schooner II is constructed of fiberglass and is equipped with full refrigeration, air conditioning, radios and radar. She boasts a 5000 mile cruising range and can take up to nine persons with a crew of two.

Charter price for the vessel is \$500 per day, or \$2,950 per week, on cruises of 7, 10 and 14 days. Itineraries include drift fishing, diving, sailing, cruising and an optional learn-to-dive program. A deposit equal to 50 percent of the charter cost is required one month in advance; travel agents are commissioned.

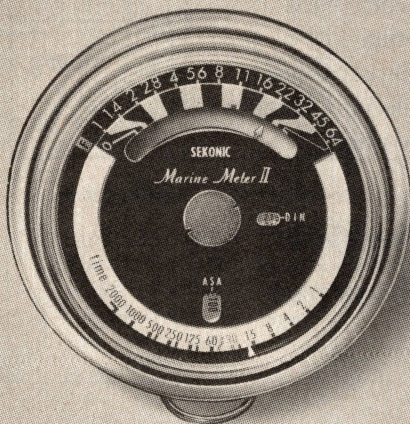
CURO Academy

On March 24, 1977, some of the members of the Council of Underwater Resort Operators (CURO) met in Bonaire with Carl C. Steensma, advisor to His Royal Highness, Prince Bernard of the Netherlands, to discuss the feasibility of joining efforts in establishing a test pilot plant for marine parks in Bonaire. CURO members present were Lee Turcotte, executive director; Captain Don Stewart, Frank Fennell, and Peter Philp representing Aquaventure, Bonaire.

CURO members expressed their desire to establish a nonprofit academy in Bonaire for the training of future resort operators. The objectives of the academy

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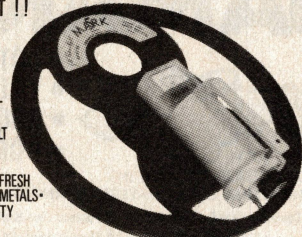
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would be to teach the most effective and modern methods of running a resort with the emphasis on reef preservation and safety standards.

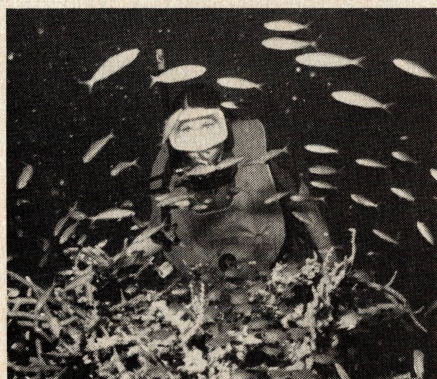
It was agreed upon that it would be necessary to conduct an extensive program of marine biological and physiological research to enable sufficient impact within the industry. The possibility of having a shallow water submersible habitat on the premises is being explored.

Attempts will be made through Steensma to coordinate the plans of CURO with those of Eurocean and the World Wildlife Federation in establishing Bonaire as the test plant for marine ecological research for world preservation of coral reefs.

See & Sea to Fiji

See & Sea offers an unusual and exciting Dive Adventure in Fiji Nov. 10-20.

The group will fly to Fiji via UTA French Airlines. Upon arrival in Nadi, Fiji, it will board a specially chartered aircraft for the remote island of Taveuni for fantastic diving. Here the 19 mile long Somosomo Reef offers crystal clear



water, crevasses, caves and large schools of reef and pelagic fish, ideal for both divers and snorkelers. Participants will live in the new Travelodge on Taveuni with comfortable rooms and good food. The dive boat is large enough to handle up to 20 divers.

After three and a half days of Taveuni's spectacular diving, the group will once again board the chartered aircraft for a return flight to Nadi. Upon arrival it will transfer to Lautoka where it will board a large and comfortable inter-island vessel for a two-hour crossing to beautiful Mana Island. Mana, located near the outer barrier reefs, is surrounded by good dive sites. The group will live in comfortable bures at this island resort for four days of diving. On the final day there will be a cruise back to Nadi, an early evening at the luxurious Regent of Fiji Hotel, and then a late evening flight home.

This dive adventure is priced at \$900 plus airfare and will be escorted on its inaugural trip by Dewey Bergman, founder of See & Sea.

For further information contact See & Sea Travel Service, Inc., 680 Beach Street, San Francisco, Calif. 94109.



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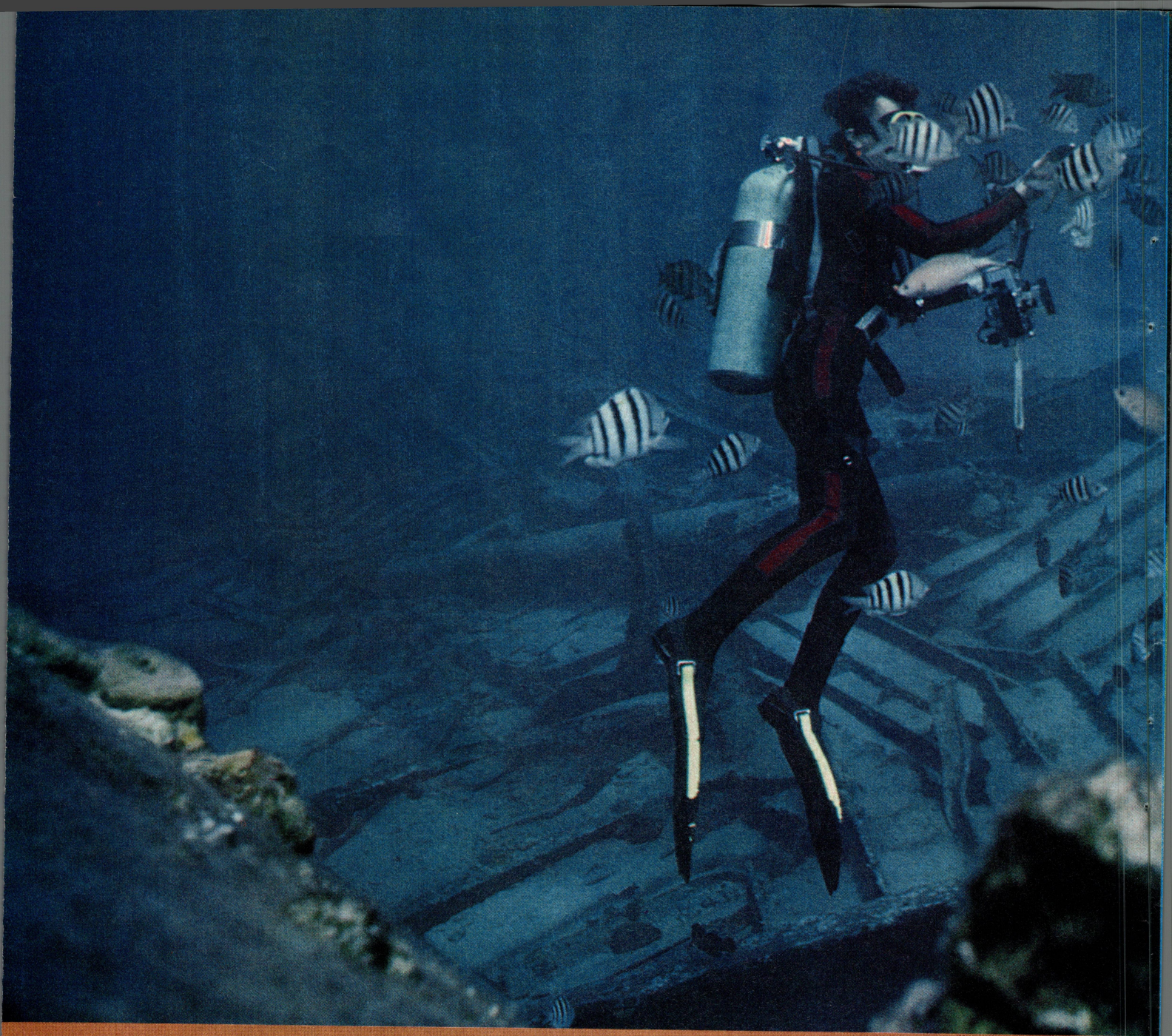
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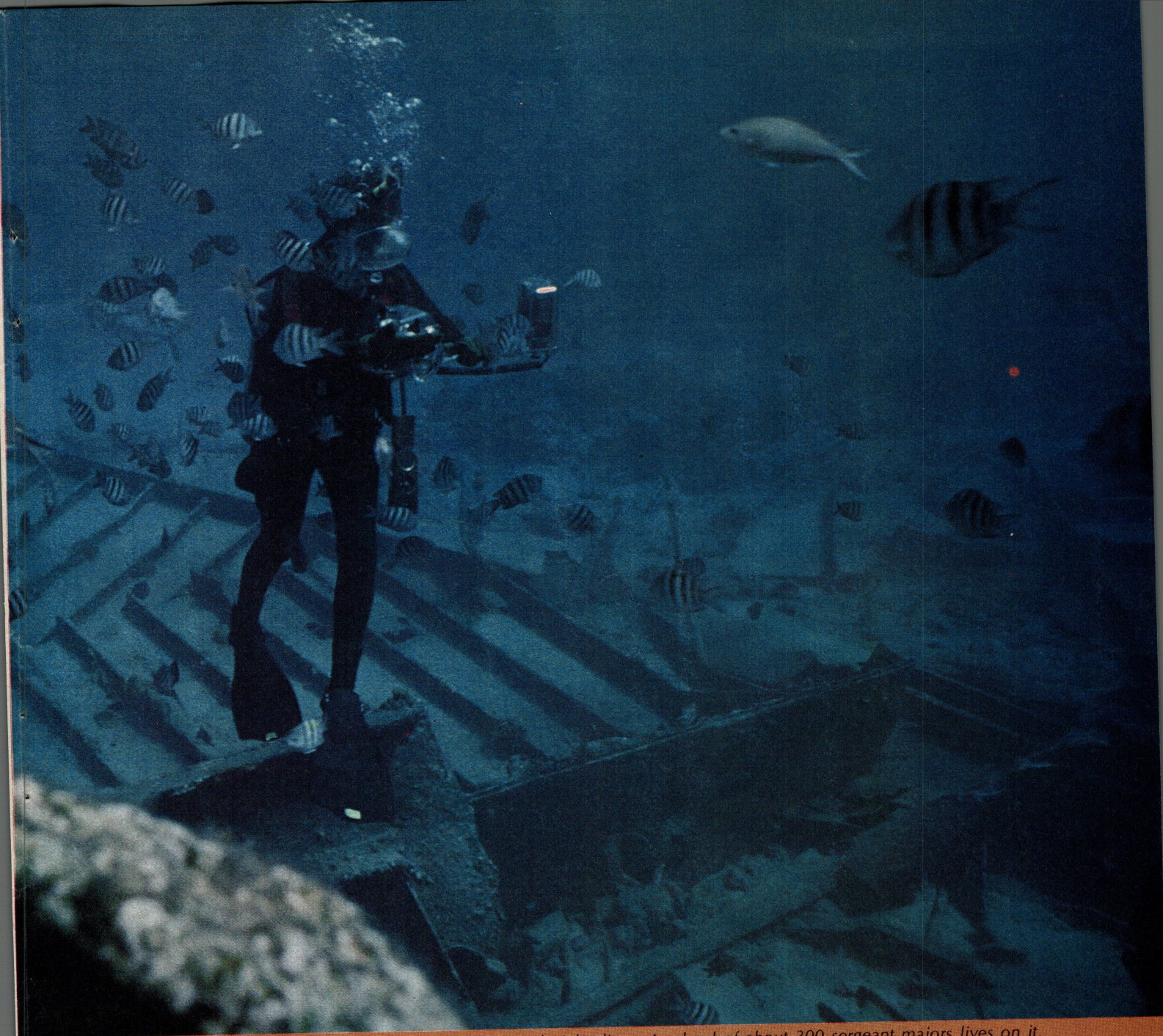


What Makes GRAND CAYMAN So Great?

**SDM probes the magic and mystery of this
Caribbean mecca for divers** By Paul J. Tzimoulis

What is it that makes one Caribbean island an incredibly popular destination for vacationing divers while others fail to attract so much as a ripple of interest? Is it visibility, coral reefs, fish, food, or luxurious hotel accommodations which cause American divers to make a gold-rush stampede for only certain islands? These were the questions running through my mind as our plane circled Grand Cayman Island on the final approach for landing.

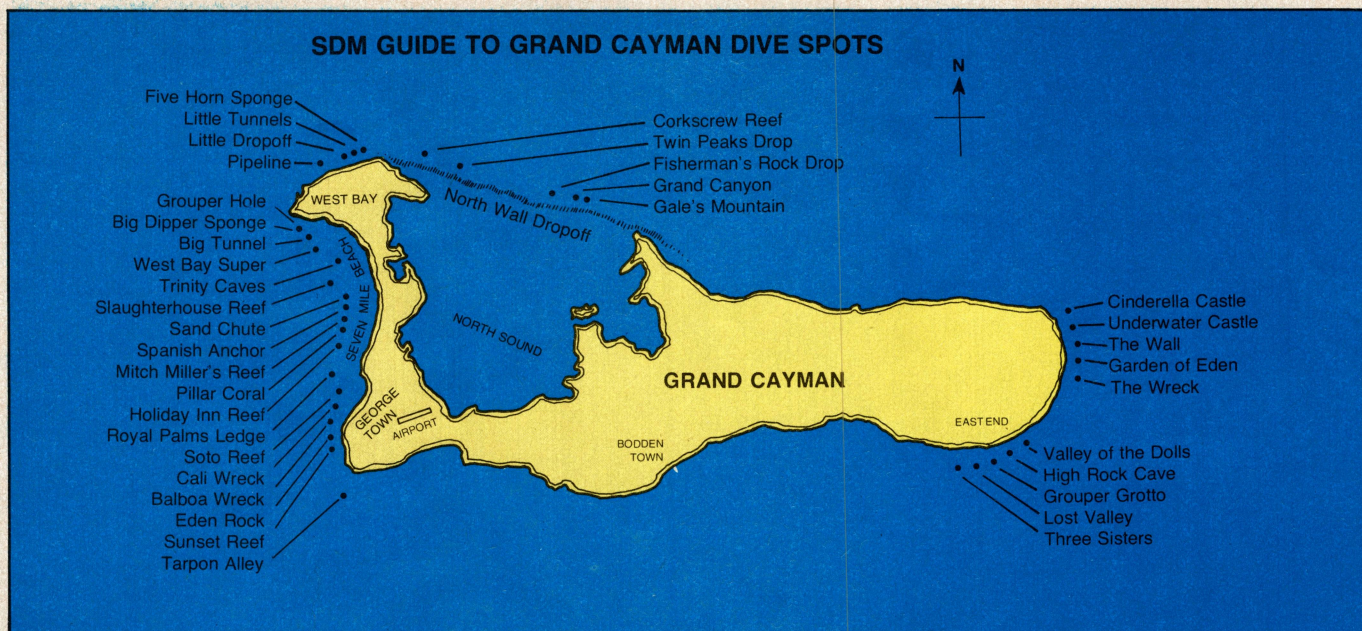
During the past 15 years, Grand Cayman, a small British colonial island in the West Indies, has risen from the depths of obscurity to become a superstar among dive resort destinations. Last year, over 17,000 vacationing divers visited Grand Cayman for an underwater holiday. There were more



The Balboa is a popular location for both fish-feeding and night dives. A school of about 300 sergeant majors lives on it. Cayman offers a variety of wall formations. The Big Dipper is one of many gigantic sponges which live on Cayman's reefs.



photography by Author



The Caribbean island of Grand Cayman has many attractions for visiting divers. Among these is the tremendous variety of dive locations. Although it is by no means complete, the map above is a guide to 37 of the island's more popular dive spots.



A small British colonial island in the West Indies, Grand Cayman is 480 miles south of Florida and 178 miles northwest of Jamaica.

than 500 divers on the island during the Christmas week.

Grand Cayman has become the largest single island in the Caribbean for dive tourism. At last count, Cayman's vast inventory of scuba facilities included a total of 18 compressors, 813 rental tanks, 26 dive boats and over 30 underwater guides. Practically every hotel on the island caters to visiting divers and at least ten of them are equipped with their own scuba facilities right on the premises.

Cayman has also become a favorite underwater filming

location for such celebrated movie-makers as Jim Dutcher of San Diego and Jack McKenney of Los Angeles. At least eight award-winning underwater films have been made in Cayman waters to date. Grand Cayman has also attracted many celebrated underwater still photographers such as: Jerry Greenberg, Jim and Cathy Church, Dave Woodward and Rick Frehsee.

The purpose of SDM's most recent visit was to find out exactly why so many divers choose Grand Cayman over and above its Caribbean neighbors. What I found was not a specific cause, but rather a unique blend of five separate factors which added up to the perfect combination for a popular dive resort island. Here are the reasons more divers choose Grand Cayman than any other island in the world.

EASY DIVING

Grand Cayman is blessed with mild, sunny weather on a year-round basis. There is almost always a lee side of the island completely protected from the prevailing trade winds, and in the summertime, flat, calm sea conditions prevail along most of Cayman's shores. There is no problem with ocean swells, surf, surge or choppy seas. Seasickness is virtually nonexistent — and this is considered a big plus among many divers, particularly from inland states.

One of the most popular spots for diving is the West Bay area, straight out from Seven Mile Beach. The waters here are often glassy calm, giving the appearance of a summertime lake. With hardly a ripple on the surface, the dive boats are able to drive right up on the beach and load hotel guests aboard for a quick trip to the offshore reefs. The boat ride hardly lasts more than five minutes, for the dive spots are conveniently located a few hundred yards offshore. The boat crews make it especially easy for their guests by assisting the divers with their tanks and other scuba gear.

Much of the diving in Cayman is along the drop-offs. Long arduous underwater swims are unheard of, as most of the diving is in a vertical mode. A guest need only drift down the sloping reef to admire Cayman's magnificent coral formations, re-adjust buoyancy and slowly cruise upward along the face of these majestic underwater cliffs. There is seldom a problem with the current, and should one arise, the dive guides are quick to caution their guests before they enter the water. In essence, Grand Cayman offers one of the gentlest forms of open ocean diving to be found in the Caribbean.

IMPRESSIVE VISIBILITY

Underwater visibility ranks high on the list of priorities among vacationing divers, and Cayman has earned a top rating in this category on a year-round basis. An average of 100 foot visibility can be found along the drop-offs during most any day's diving. There are, however, certain times of the year when Grand Cayman enjoys spectacular 200 foot visibility along certain sections of the drop-off. This condition usually occurs when the seas are flat and there has been no rainfall for at least a week. It is during these periods that Cayman's reefs are washed clean by the pure oceanic currents which exist in the abyssal deep just a mile off shore.

Good visibility is especially enjoyable when viewing the majestic formations of Cayman's walls. Many of the coral structures are massive in size and can only be appreciated when viewed from a distance. For photographers, Cayman offers an irresistible lure for dependably clear conditions.

INFINITE VARIETY

Perhaps one of Cayman's greatest attractions is its infinite variety of underwater marine life and coral formation. You can almost say that Cayman has as many dive spots as it has scuba tanks. Charted dive locations number in the hundreds, and there are still many more which remain the guarded secret of

stand apart from the main wall. There is one spot at the northern end of West Bay, named Big Tunnel, which offers a breathtaking view of a huge coral archway measuring 30 feet wide and 50 feet high. At another location, called Trinity, there are three long winding coral tunnels which exit onto the face of a vertical wall. At still another location on the North Sound Wall, there is a peculiarly formed corkscrew chimney which leads from the top of the wall to an exit on the outer face at 130 feet. The drop-offs often have different marine life.

Of all the islands visited by divers, Grand Cayman could rightfully claim the title "Sponge Capital of the Caribbean." Few places offer the variety, the abundance or the immense size of the sponges found on Cayman's reefs. There is one sponge off West Bay, called the Big Dipper, which easily measures five feet high and eight feet in diameter. It is big enough to hold at least three or four scuba divers and all of their equipment. Less than 30 feet away is a barrel sponge almost the size of a Volkswagen. These are only two of many gigantic sponges which inhabit the deeper coral reefs.

There are also many sponges of rather strange and exotic forms. For example, there is one huge chair-shaped basket sponge called Neptune's Throne, situated under a coral ledge at a dive spot known as Pipeline. The massive lavender sponge is large enough to comfortably seat a scuba diver complete



Much of Cayman's diving is along the drop-offs. You need only drift down the sloping reefs, admiring majestic coral formations and other marine life. After a day of diving, a sunset sail is soothing.

individual dive guides.

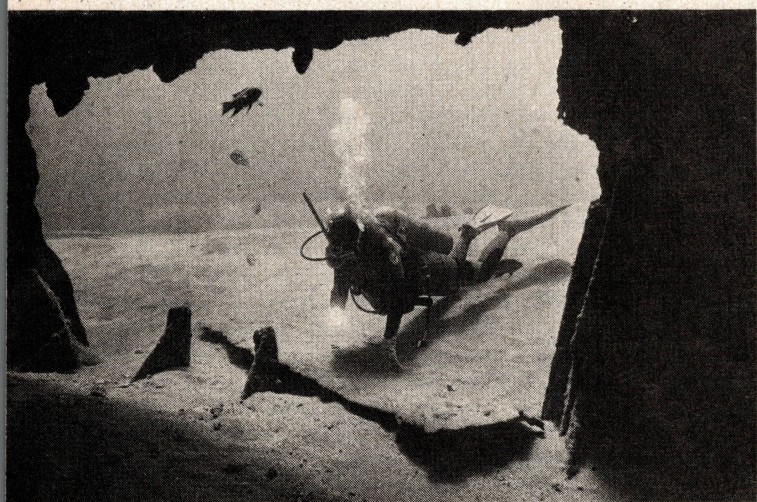
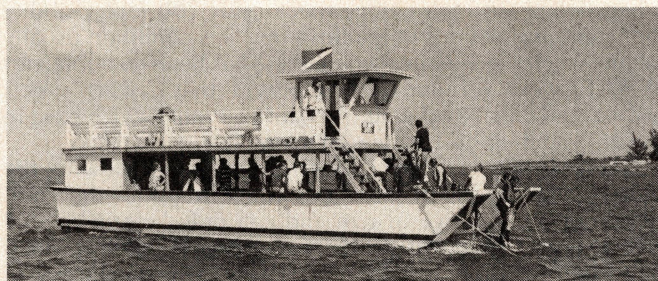
Cayman is best known for its drop-offs, for this tiny island is surrounded by vertical walls of coral which plunge downward into the ocean deep. However, these are not all the same, as Cayman offers a tremendous variety of wall formations. For example, certain areas of the North Sound Wall are absolutely vertical, and as even as a wall in your home. Other locations along the same reef are etched with great coral canyons, undersea ramparts, horizontal shelves, and pinnacles which

with tank. It is nestled under a coral overhang in 50 feet of water, and faces outward toward the open ocean.

Still another rare phenomenon of Cayman's undersea reefs is the unusual abundance of crimson sponges. Blood red in color, these unusual sponges grow in size from a few inches to basket-shaped formations measuring two feet tall, and adorn the vertical coral walls from depths of 40 feet to 130 feet. They are the most brilliant sponges found in the Caribbean.

As for shipwrecks, Cayman offers some of the most conve-

Southern Airways offers daily nonstop flights to Cayman from Miami with connecting flights from Chicago, Detroit, Huntsville, Memphis, Atlanta, Birmingham and other major cities. Below right is a dive barge, with a front dive ramp and a sunbathing deck.



Cayman offers some conveniently placed wrecks. One of these is the *Balboa* which is less than 100 yards away from the town dock. It was a 375 foot steel-hulled cargo vessel which sank in 1932. One portion of the hull forms an underwater cave. Each of the drop-offs has a different shape and often, different marine life.

niently placed wrecks one could imagine. Not more than 100 yards straight off the town dock lies the wreck of the *Balboa* — the most frequently dived shipwreck in Caribbean waters. The *Balboa* was a 375 foot steel-hulled cargo vessel which sank in 1932. She was subsequently dynamited and her wreckage is now scattered over five acres of ocean floor. Average depth on the wreck is 35 feet and visibility ranges from 75 to 100 feet. Her most prominent features include: a steam boiler, her bow section, part of the stern section, and a large, three-bladed propeller which sits up high and offers a perfect backdrop for underwater photography. Many portions of the ship's hull and steel beam structures are colorfully decorated with coral, sponges, and other beautiful marine life. There is one portion of the ship's hull which is lying flat on the bottom and offers entrance from beneath. The slightly rounded structure provides the makings of an artificial underwater cave and an ideal haven for fish life.

The *Balboa* is also a popular location for both fish-feeding and night dives. A school of approximately 300 sergeant majors now lives there, and these small reef fish have become extremely aggressive because of the constant fish-feeding activity. At times, these hungry little devils act almost like a school of piranha in their excited efforts to compete for the food. If one is intending to feed the fish, he or she should wear heavy gloves and be prepared for an occasional disarming nip on the arm, leg or earlobe.

Less than 200 yards from the *Balboa* lies the wreck of the *Cali*, another cargo ship which was carrying a load of rice. This ship lies even closer to shore and depths range from 10 to 25 feet. The *Cali* is an excellent spot for snorkeling and beginning scuba. But even more important, this particular wreck offers tremendous opportunities for the underwater macro photographer. Because of its shallow, warm, nutrient-rich waters, this particular wreck is inhabited by a wide variety of small creatures and juvenile reef fish. One of the most prominent forms of marine life on the *Cali* is the great number of Christmas tree tube worms. There seem to be hundreds of them, ranging in many bright colors. Also found on this ship are many feather duster worms and anemones. A close-up photographer could easily spend a full day diving here and still not run out of subjects.

In addition to the wrecks, drop-offs, caves, and tunnels, Grand Cayman also offers an excellent variety of shallow reefs. Most of these are located 100 to 200 yards offshore with depths ranging from 10 to 30 feet. There are long coral ridges adorned with huge purple sea fans and forests of staghorn coral. Quite often, you'll find a single coral head of massive proportions just sitting out on a white sand bottom and surrounded by schools of small reef fish.

Some of these shallow reefs can be reached by beach diving. One of the favorites is Little Drop-off, located directly out in front of Spanish Bay Reef Hotel. This particular reef offers a

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Grand Cayman Island, B.W.I.
Jim Dailey, Owner
Telephone: 9-2724, 9-4349, 9-2252

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SEE & SEA TRAVEL SERVICE
680 Beach St., Suite 340, Wharfside
San Francisco, CA 94109
Carl Roessler, Gen. Mgr.
Telephone: (415) 771-0077

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P.O. Box 1516
Grand Cayman Island, B.W.I.
Capt. Butch
Telephone: 9-4430

SUNSET HOUSE

P.O. Box 479
Grand Cayman Island, B.W.I.
Adrian Briggs, Manager
Telephone: 9-2511

CAYMAN KAI RESORT, LTD.

P.O. Box 1122
Grand Cayman Island, B.W.I.
Dick Polk, General Manager
Telephone: 7-2573

TORTUGA CLUB, LTD.

P.O. Box 496 East End
Grand Cayman Island, B.W.I.
Suzy Bergstrom, Owner
Telephone: 7-2488

small vertical wall which starts at 20 feet and drops down to 45 feet. The area is covered with tightly packed corals, sea fans, sea plumes and sponges. It is an excellent area for underwater photography, fish watching, and reef exploration — and an excellent spot for catching an extra dive between or after the regularly scheduled boat trips.

Other beach dive locations include the shallow reefs off Casa Bertmar, Sunset House, and Spots Bay. As for snorkeling areas, there are many good locations including: the reef off Cayman Cai, Eden Rocks, Rum Point, the wreck of the *Palace*, and North Sound Reef.

SCUBA FACILITIES AND BOATS

If there is one thing which could be said for Grand Cayman, it is that the island has no shortage of scuba equipment or dive boats. No other resort island comes close to matching the tremendous inventory of tanks, compressors, boats and dive gear which Cayman offers. There are 12 separate diving operations located on Grand Cayman and another located on the nearby island of Cayman Brac. Visiting divers are by no means restricted to diving with the boat or guide located at their hotel, but instead can sample the services and variety of dive locations offered by a number of different operators.

Because of the tremendous amount of diver traffic and experience which Grand Cayman has logged over the years, visitors will notice a number of unique innovations in facility design. For example, Grand Cayman is one of the few islands where dive boats have either been customized or completely built for the specific purpose of scuba diving. One of the most unique designs is the Cayman dive barge, which incorporates a front dive ramp which can be lowered to the level of the water for easy exits and entries. The front ramp is also a convenient device for loading diving customers and equipment when the boat is pulled up on the Seven Mile Beach. The dive barge incorporates a design very similar to the landing barges used extensively during WW II for quickly off-loading troops on enemy beaches. Bob Soto has also built a top deck on his barges for sunbathing and non-diver passengers who like to go along for the ride and watch the divers.

Another dive boat design which is enjoying considerable popularity is the triple-hull Flattop. This unique craft consists of a flat deck (like an aircraft carrier) which measures 34 feet in length and 14 feet wide. It is mounted on three fiberglass pontoon hulls and powered by twin outboard motors. The Flattop design offers a maximum amount of deck space for equipment and an extremely stable platform for dressing and entering the water.

Because of the high degree of competition and large number of divers moving through this island, all of the dive facilities are well maintained and the equipment kept in perfect working order. Almost every dive operator has at least two compressors in case of equipment breakdowns or servicing.

Another very important point worth mentioning is the fact

that every dive resort operation is supervised by certified scuba instructors who have received extensive training in the U.S. Most all of the underwater guides and dive shop operators have received instructor certification from PADI, NAUI, YMCA, NASDS or BSAC. The island's dive operators maintain a high level of scuba safety and make a conscientious effort continually to improve and update their facilities. Incidentally, Grand Cayman is one of the few islands which maintains an operational recompression chamber for the specific purpose of treating bends and embolism accident cases. Although there have been few such accidents, the operators of this chamber continually drill and practice the use of the chamber in the event that such an emergency should occur.

Grand Cayman is also home port for one of the best known dive cruise ships in the Caribbean — the *Cayman Diver*. Some 86 feet in length and containing berths for 12 diving guests, this converted Coast Guard cutter has been completely customized into the ideal dive vessel. Skipped by Capt. Paul Humann, the *Cayman Diver* makes a one-week tour of the top dive spots around Grand Cayman, with an occasional side trip to Little Cayman when weather permits. The ship is completely self-sufficient with its own galley, scuba tanks, and air compressor. The *Cayman Diver* runs some 30 cruises per year.

EASY TO REACH

Grand Cayman owes a good portion of its diving tourism success to the government's wisdom in maintaining a modern airport and runway facility. Although this island has little industry other than tourism, three separate airlines operate daily flight service from the U.S., and the flights are often booked solid. Grand Cayman has become one of the easiest islands in the Caribbean to reach from the standpoint of convenient air service connections.

For example, Southern Airways offers daily nonstop DC-9 jet service from Miami, with connecting flights from Chicago, Detroit, Huntsville, Memphis, Atlanta, Birmingham, and many other major cities in the south. Their flight departs from Miami at 1:45 p.m. and arrives in Cayman at 3:01 p.m. — a trip lasting only one hour and 15 minutes. The return flight departs Cayman at 3:30 p.m. and arrives in Miami at 4:42 p.m. Cayman Airways and LACSA Airlines offer similar jet service on a nonstop basis. A passport is not needed for entry into Grand Cayman, as proof of U.S. citizenship is equally acceptable. A copy of your birth certificate or your voter registration card will do just fine. You can fly to Grand Cayman any day of the week and there are good airline connections with other parts of the U.S. via such airlines as: National, Continental, Delta, or Eastern.

As you can see, it is not one single factor which makes Grand Cayman so great, but instead a variety of different aspects which come together as the perfect combination for an ideal dive vacation. If you're still not convinced, go to Grand Cayman and see it for yourself. 🐠

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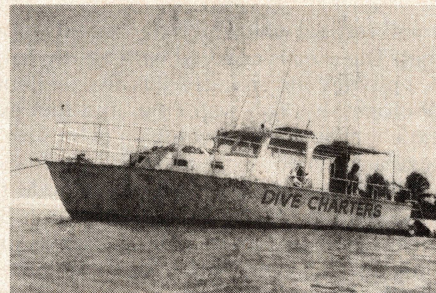
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From May to October, the Caribbean
School of Aquatics, Inc., runs five and
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The islands visited during the cruise
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travel, allowing maximum time to enjoy
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daily and there is a full program of ad-
vanced dives, which include night div-
ing, deep diving and wreck diving.

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staff to teach or to assist a stateside in-
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The Scuba Safari is offered on a limited
basis. It can handle up to ten divers and
needs a minimum of eight to make a trip.
Reservations must be made two months
prior to departure and paid in full, one
month in advance. A brief resume of dive
experience is required of each member
of the dive party.

The five day trip is \$290 per person
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cludes all transportation, food, air, tanks,
backpacks and weights, but not air fare.

Outside the water, excitement also
abounds. San Juan is one of the hottest
night spots to be found anywhere. There
are nightclubs with internationally fa-
mous performers and gambling casinos.

U.S. Citizens need no passports and
U.S. driver's licenses are valid for 120
days. The national language is Spanish,

however English is spoken by most islanders. For more information contact: Caribbean School of Aquatics, Inc., La Concha Hotel, Ashford Ave., P.O. Box 4195, San Juan, Puerto Rico 00905. >

Ramada Reef Raiders

The Ramada Inn of Key West, in conjunction with Reef Raiders Dive Shop, has formed the Ramada Reef Raider dive package, combining diving on living reefs with the excitement of Key West.

The package includes a welcome cocktail, air conditioned room with color TV, continental breakfast, free airport transfer, shopper's discount book, sunset island cruise, Conch Train tour of Key West, souvenir posters and diving.

Three different plans are available, from four days and three nights to eight days and seven nights. Including diving, the price begins as low as \$150.50 for triple occupancy. The four-day price includes three reef trips; the six-day package permits four reef trips; and the eight-day stay will include six reef trips. Special prices are also available for non-diving traveling companions.

Call the Key West Ramada Inn direct at (305) 294-5541 or the Ramada Central Reservation's toll free number at (800) 228-2828. Or write to Mark C. Thornburgh, Ramada Inn, 3420 N. Roosevelt Blvd., Key West, Florida 33040. >

Florida Keys Repair Center

Bill Crawford's Tropic Isle Dive Shop now has complete repair facilities and trained personnel to accommodate many service functions for divers' malfunctioning equipment.

Tanks can be hydrostatic, tumbled, cleaned, and VIP'ed with special lights and equipment. Regulators, valves, BC's and all types of gear can be repaired. A complete parts inventory for all brands is available. The shop also repairs such cameras, strobes, and housings as Nikonos, Ikelite, Subsea, Fuji, Oceanic.

Also, a special precision hydro test chamber where cameras, strobes, lights, decometers, watches, depth gauges, etc. can be tested from 0 to 300 feet has recently been installed. >

The Island of Dr. Moreau

While filming *The Island Of Dr. Moreau* on location in St. Croix, U.S. Virgin Islands, several of the cast took advantage of the excellent diving available. Scuba enthusiast, actor Michael York, and his wife Pat, had the chance to make several dives and to snorkel the Buck Island Underwater Trail between shooting schedules.

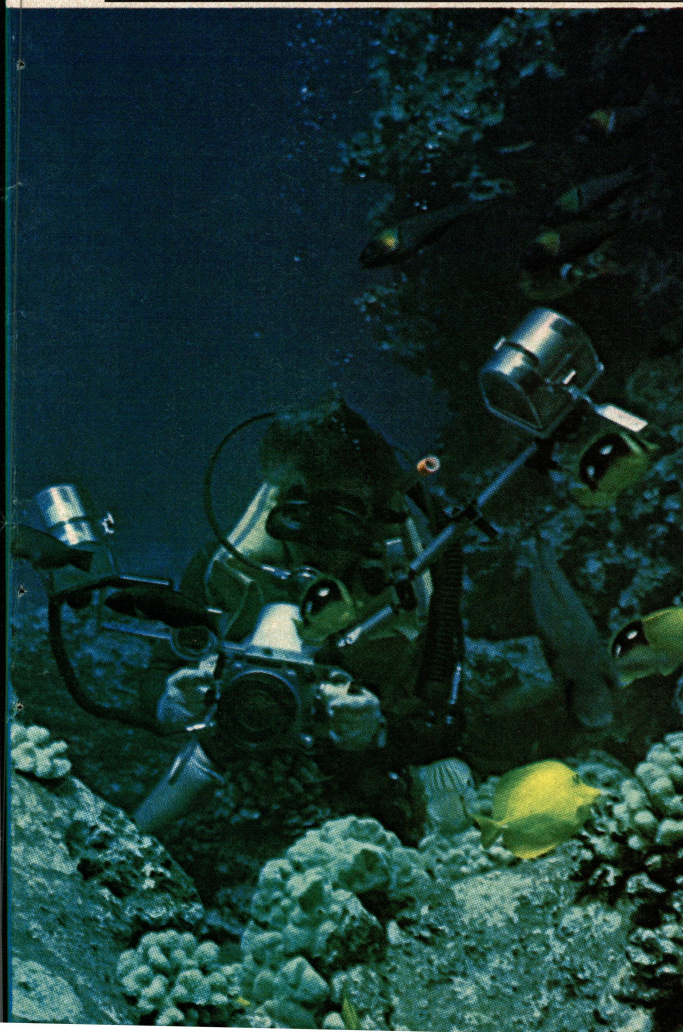
Bret Gilliam of V.I. Divers Ltd. took



Actor Michael York, Bret Gilliam of V.I. Divers Ltd. and Director Don Taylor on location during filming of *Dr. Moreau*. photo by David Cover

part in the filming of the special effects and ocean sequences at the film's beginning and its dramatic conclusion. The 38 foot dive boat *Novie* was used as the camera vessel to film Michael York and co-star Barbara Carrera in the lifeboat escape scenes and several in-water scenes.

The movie was adapted from the original H.G. Wells novel about a scientist, played by Burt Lancaster, who transforms animals into humans. The superb makeup artists from *Planet of the Apes* handled all the special effects. Scheduled for release this summer, *The Island Of Dr. Moreau* is the first major film production to be produced in the Virgin Islands. >



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SA-7

New Engines for the Plus Ultra

Capt. Bob Klein has replaced the engines of the 50 foot dive boat, *Plus Ultra*. The new engines are capable of speeds in excess of 40 knots. The *Plus Ultra* is docked at the Holiday Inn in Key Largo. For information on dive trips contact Capt. Klein's Holiday Inn Scuba Shop, U.S. Hwy #1, Key Largo, Fla. 33037.

Ocean Study Center In Mexico

Owen Lee and Ramon Bravo announce the opening of El Centro de Estudios Oceanicos — the Ocean Study Center. Located 120 miles north of Acapulco on Las Gatas Beach in Zihuatanejo, Mexico, the new center seeks to advance a general awareness of the sea's vital importance to life.

The center will be quartered in Las Gatas Beach Club, a seaside resort complex, which will provide certain facilities to scientists and teachers who want to study the sea or to conduct sea seminars in collaboration with the staff. The seminars include programmed instruction on marine ecology and biology, sailing and seamanship, snorkeling, scuba diving and underwater photography. Surfing and language instruction are also available. The seminars are conducted by cer-

tified instructors. Interested groups are invited to inquire.

The opening of the Ocean Study Center on July 1st coincided with the beginning of Camp de Mar — a six week long coed summer camp for 20 teenagers. After the conclusion of Camp de Mar on August 15th, the Ocean Study Center will be open to private groups.

Prior to establishing Camp de Mar and the Ocean Study Center, Ramon Bravo and Owen Lee worked with Captain Jacques-Yves Cousteau aboard the *Calypso* as underwater camera men and film lecturers. Between them, they have authored seven books and produced 18 films about diving and various aspects of the sea. Aiding them is a professional staff of certified teachers, guides, and administrators.

Additional information is available from Camp de Mar, 548 La Guardia Place, New York, N.Y. 10012 or Camp de Mar, Apartado Postal 81, Zihuatanejo, GRO. Mexico.

Hi! There Expands Routes

Pat Anderson, owner of the M/V *Hi! There*, has recently received her 100 ton Coast Guard Captain's license. Because of this, *Hi! There*, Inc. can extend its charter routes.

For the past three years, Captain Pat has run charter dive trips to the Bahaman



waters around Cay Sal Banks — with specific concentration on the famous Cay Sal Blue Holes. Regularly scheduled trips to Cay Sal are always part of Captain Pat's calendar.

Now, however, *Hi! There*, Inc. is expanding its services to include year-round cruises up and down the Florida Keys. These trips will vary in length depending on group preference. And, in the summer, Captain Pat will offer dive trips to Bimini, a string of Bahaman islands which offer shallow reefs, wrecks and walls.

For more information about trips to Cay Sal, Bimini or the Florida Keys, contact Captain Pat Anderson, *Hi! There*, Inc., P.O. Box 487, Islamorada, Fla.

UPS Film Festival

Armchair explorers and seasoned divers alike will enjoy a kaleidoscope of underwater sights at the 13th Annual Underwater Film Festival, to be held Sep-



At the Holiday Inn. In Grand Cayman. It's the best place to stay on the best island for diving in the whole Caribbean. Here's why.

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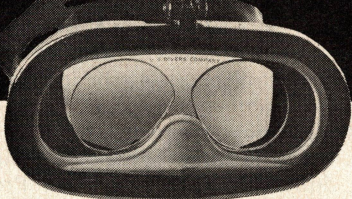
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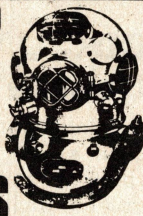


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tember 16 and 17 at 8 P.M. in the San Diego Civic Theatre.

Each night's show is unique, with both performances offering four feature length documentaries by top film makers, as well as slides showcasing the work of outstanding San Diego photographers.

Those attending the performances will receive a complimentary four-color souvenir program with many beautiful photographs, including one suitable for framing.

The San Diego Underwater Photographic Society, sponsor of the event, will provide a lobby display of color enlargements of photographs taken by its members. An extensive collection of antique and modern underwater photographic equipment will also be on display.

Tickets for the performances are \$4.50, and may be purchased at the door. Advance sales for the non-reserved seats will be held at the San Diego Civic Theatre box office and local dive shops. Tickets may also be ordered directly from Frank Trousdale, % The San Diego Underwater Photographic Society, P.O. Box 82782, San Diego, Calif. 92138.

A non-profit organization dedicated to the promotion of underwater photography, the society was organized in 1961 by a small group of enthusiastic divers under the leadership of Ron Church, a pioneer in the field.

Proceeds from the annual event are used to maintain a research grant program which supports exciting new concepts in photographic documentation. The support includes financing of production costs, and may lead to screenings for festival audiences. These grants permit talented underwater photographers to develop projects for art's sake, intellectual curiosity, or simply to show the beauty of inner space. >>>

Great Lakes Dive-In

The Second Annual Great Lakes Dive-In will be held by the Midwestern NASDS store/schools at the Playboy Club at Lake Geneva, Wisconsin, on September 30th through October 2nd.

This three day event, hosted by NASDS store/schools is open to all certified divers from any program that is a member of the National Scuba Training Council (NSTC). Contests in dive ability and underwater photography will be included in the activities with emphasis on having a great party and a great time. First prize will be a round trip to the NASDS dive resort, Caye Club Aquarius.

Tickets and more information are available from any NASDS store/school in the Midwest. If you are a diver from outside the area and would like to attend the Dive-In, contact Bill Novotny at the Aqua Center, 717 Morton Avenue, Aurora, Ill. >>>

MARK IT QUICK OR LOSE IT!

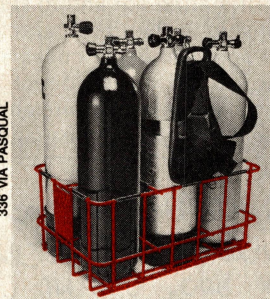


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☐ **6-Pac Tank-Rack, \$38.00**

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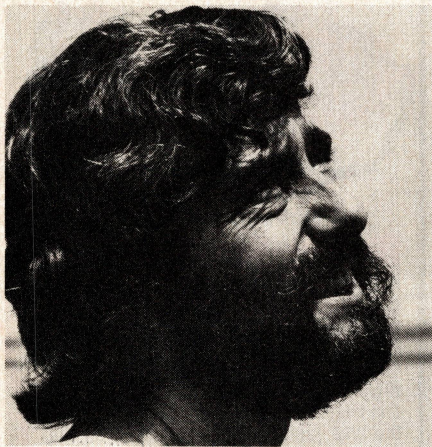
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DEALER INQUIRIES INVITED

Project Ocean Search

The Jean-Michel Cousteau Institute, a public, nonprofit corporation, on Hilton Head Island, South Carolina, has announced three Project Ocean Searches™ which will be conducted this summer.



Jean-Michel Cousteau

Project Ocean Search, an educational program in applied oceanology designed for students and the general public, offers an opportunity to investigate the nature and diversity of marine life and to study man's relationship to the ocean and the environment. The new experiences and understanding gained during direct involvement in the programs inspire an increased appreciation of the sea and a

strong desire to protect and preserve our environment.

Each program is characterized by intensive learning in the field, near, on and in the sea. Emphasis is on the actual experience of being a living part of the area that is being studied, along with the sharing of experiences with others of the study group and the Cousteau team. Dr. Jean-Michel Cousteau and his staff take the participants through a wide range of studies that provide an understanding of how we fit into the global ecosystem, how we can make use of it and at the same time recognize its fragility and delicate balance.

Some of the programs' highlights include: skin or scuba diving, estuarine ecology, continental drift, earth ecosystems, plankton studies, coral reef communities, turtle ecology, open sea ecosystems, fish and invertebrates behavior, drugs from the sea, marine mammals, shrimp fishing, field studies, underwater photography, and more.

Cousteau and his team have conducted these programs since 1973 and for the summer of 1977, the Institute offers the following:

Project Ocean Search™, Antigua Island, in the Caribbean. From July 5 to July 24, 1977. Fee: \$1,500 all inclusive.

Project Ocean Search™, Catalina Island, California. From July 29 to August 7, 1977. Fee: \$580 all inclusive.

Transportation to and from the projects' locations is the responsibility of the

participant. Each project is open to all persons over 16 years old. Good health and strong motivation are essential but diving is not a prerequisite. Optional academic credit will be available.

The Institute expects to be in a position to offer a number of scholarships for each project through sponsorship by businesses, industries and individuals designating donations specifically for Project Ocean Search™.

To join or become a sponsor of Project Ocean Search™, please contact: The Jean-Michel Cousteau Institute, P.O. Drawer CC, Harbour Town, Hilton Head Island, S.C. 29928 or 8430 Santa Monica Blvd., Los Angeles, Calif. 90069.

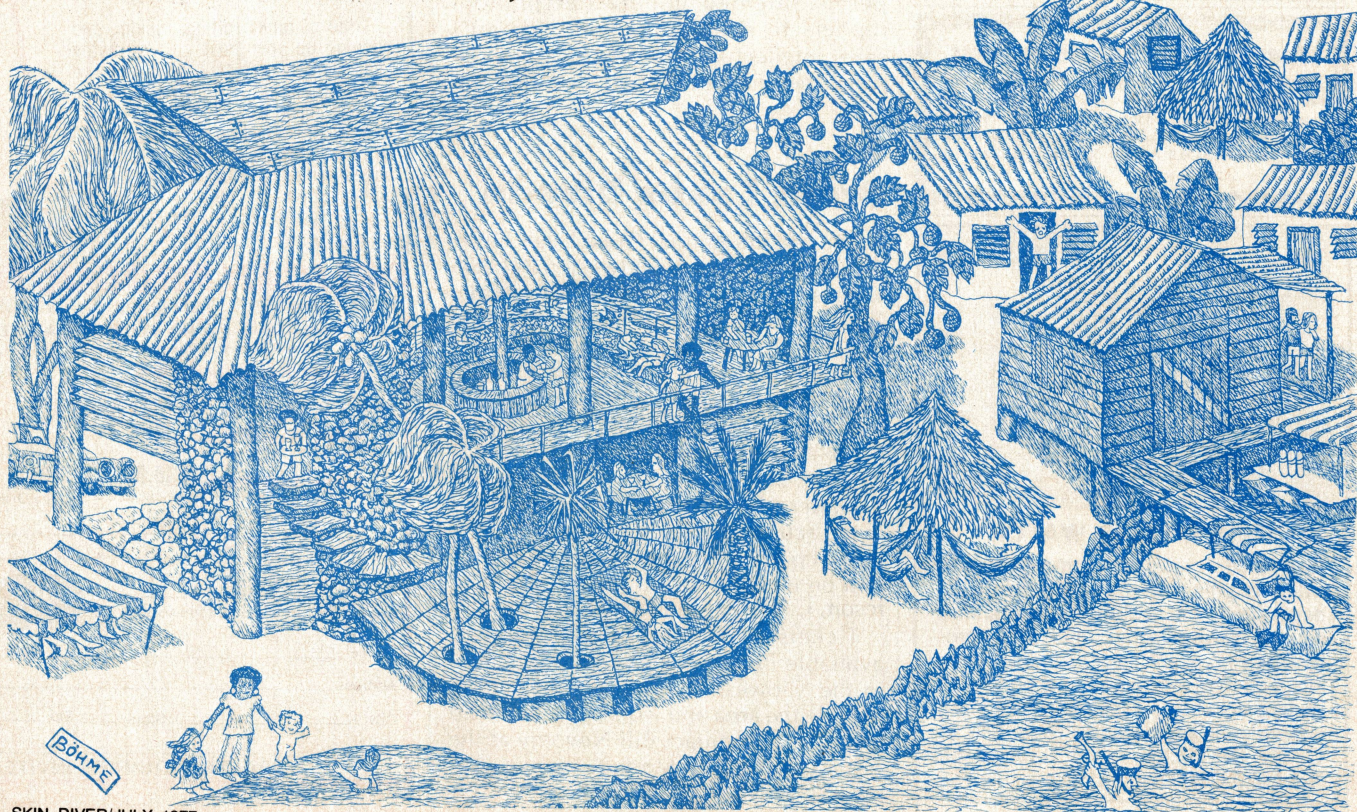
CDC U/W Photo/TV Course

"Underwater photography and television skills have become critical specialties in the international petroleum diving industry, and the future demand for trained deep sea divers with U/W photo/TV skill is going to mushroom," comments Jim Joiner, executive director of the L.A. Harbor-based Commercial Diving Center in Wilmington.

"As commercial diving goes into greater depths, the demand for the subsea photographer will become acute, and CDC has redesignated its U/W Photo/TV course to keep pace with the industry's requirements."

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A major part of the increasing demand is the necessity to record and monitor critical phases of the offshore oilfield operations which are potential dangers to the environment.

In the preliminary stages, photographic reconnaissance of seabed conditions, visibility, and bottom geological formations provide vital data in planning extraction operations. Throughout offshore operations, scheduled inspections of the subsurface structures of the platform provide a history of the accumulation of sea growths, deterioration of metal components, and structural damages caused by metal fatigue, currents and wave action. One of the phenomena of the underwater camera lens is its ability to see farther than the diver, particularly on conditions of murky water — a normal problem to a commercial diver — in which the optics detect the photo subject before the diver.

Although petroleum diving offers the major job source for the diver/photographer, other industries have increasing demands for the skill. An example is the continuous photographic studies being made of the environmental impact of the offshore discharge areas from the San Onofre Nuclear Power Plant off Southern California. Following the major earthquake a few years ago in the Sylmar area, government agencies conducted extensive photography and television studies of the damages to the faces of dams to provide data to guide construction repairs. Diver/Photographers of the U.S. Army Corps of Engineers compile data on locks, dikes, and the thousands of miles of levees along major rivers.

The photo/television course at CDC is designed to train the deep sea diving school's graduates with the skills and techniques of photographing color and black and white stills, and videotaping. The course features underwater training in optics, cameras, lighting and composition. Graduates of the course have had preferential hiring in petroleum diving.

The amateur sports diver and photographer who wants to combine where he like to be with what he likes to do, can "package" his lifestyle and turn professional in a rewarding career. 

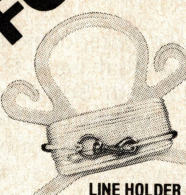
Eldon to Rep. Beall

Glenn Beall Industries, marketer of sport diving and underwater photography accessories, has named Eldon Industries of Canada, Inc., as its exclusive sales representatives throughout Canada.

Eldon Industries, located in Don Mills, Ontario, has a national sales force and is the largest importer and manufacturer of dive equipment in Canada.

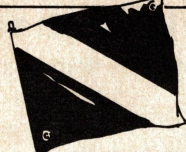
The Beall organization is headquartered in Gurnee, Illinois. 

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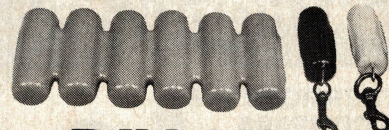
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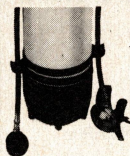
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U/W Archaeology

(Continued from Page 57)

later it was lost on Lake Ontario and not long ago it was found and salvaged. During the War of 1812 both British and American vessels were lost on the Great Lakes in inclement weather and in battles. Two American gunboats, the *Hamilton* and the *Scourge*, both two-masted schooners, were discovered in 1973 in Lake Ontario near Niagara Falls. They lie at 275 feet which makes salvaging difficult. They were located by a magnetometer and identified through the use of an underwater television camera which was lowered to them.

More than 500 vessels dating from the era of wooden-hull sailing ships have been lost in rivers along the United States' eastern seaboard. The majority were seventeenth and eighteenth century merchantmen which sank in storms on rivers or near settlements of the early colonists. The remainder were warships such as those the British lost at Yorktown in 1781. Some of these undoubtedly have been destroyed in dredging operations but many still lie on the bottom and ought to be relatively easy to locate.

Many paddle-wheel steamers were lost on America's major rivers including the Mississippi, Missouri, Ohio and Hudson. The cover of the October, 1972 issue of *Archaeology* magazine depicted a map showing the locations of 58 steamboat wrecks lost on a mere 200 mile stretch of the Missouri River between 1842 and 1862. On the smaller Tennessee River upwards of 200 paddle wheelers were lost.

During the Civil War a number of blockade runners and gunboats sank in rivers. The *Cairo*, one of the first iron-clads ever built and the only gunboat which remains from the war, was sunk in 1862 on the Yazoo River near Vicksburg, Mississippi. It had the distinction of being the first ship ever sunk by an electrically-detonated mine. The site of this wreck was discovered in 1956 and the 176 foot long ship was cut into three sections and carefully raised, reassembled and placed on display in a museum near Vicksburg. This is a good example of how divers overcame the hindrance of almost total lack of visibility. The amateur divers worked entirely by feel. In the process of using water jets to remove the mud covering the *Cairo* and in slinging cables under her hull to assist in raising her, they found many weapons, crockery, tools and other artifacts — all without being able to see anything.

In addition to the loss of larger vessels on rivers, many smaller craft such as ferry boats, fishing boats and even canoes sank. In many cases these small craft were very buoyant and when they cap-sized or overturned in strong currents or

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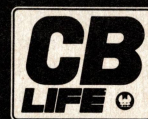
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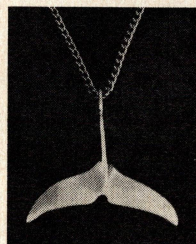


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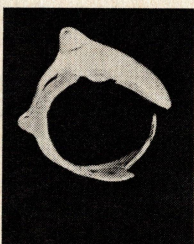


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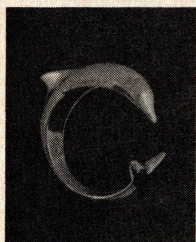
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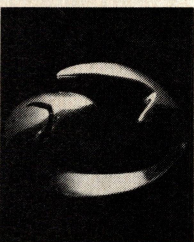
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rapids the contents spilled out but the craft were not lost. This happened in the case of the birchbark canoes the French voyagers used along the water route of lakes and rivers which forms the present boundary between Minnesota and Ontario. Lives and merchandise were lost in the lucrative fur trade which began early in the seventeenth century. Trade goods were brought to Grand Portage on Lake Superior from the East and then transported by the voyagers over long distances to trade for furs with the Indians. The many dangerous rapids along their routes bear testimony to the hazards they faced. The river beds near these rapids are strewn with the vestiges of the canoe cargoes. In the past ten years with the help of amateur diver-archaeologists, the Minnesota Historical Society has investigated many of these sites and recovered a wealth of material including kettles, tools, flints, knives, beads and buttons. When any items from an overturned voyager's canoe can be dated and compared with similar articles found on Indian sites on land, the chronological framework for many North American Indian sites is strengthened.

Although anchors are not in the same category as shipwrecks, they are so closely associated with ships that they may be included. Tens of thousands of anchors were lost in ports and harbors over the centuries. Sometimes an anchor was fouled in something and couldn't be raised. Anchors were sometimes deliberately left when a ship had to make a precipitous departure and cut the cable. They were lost along coasts when ships stopped to await a change in wind direction, for another ship to catch up, or even when ships anchored for the night along treacherous coasts. The discovery of old anchors, even unassociated with wrecks, provides invaluable information about early sea routes. When identified and dated they can offer excellent clues about who reached what, where and when. In some cases, finding an anchor leads to discovery of a wrecked ship, since a ship being swept onto a lee shore in a storm would try to drop anchor, in an attempt to stay in safer water. In most such instances the cables parted and the anchors were lost. I have found a score of ships after first finding an isolated anchor in an unlikely area.

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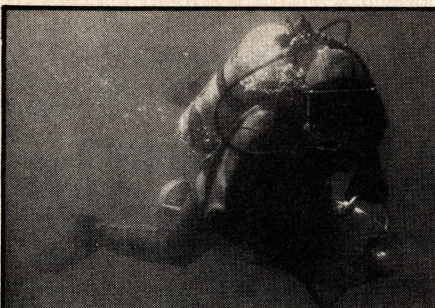


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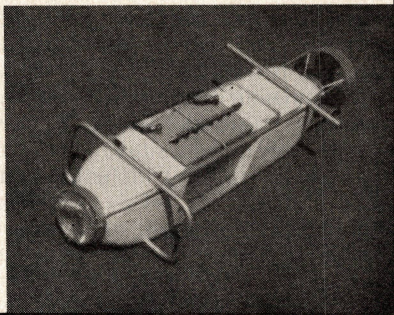
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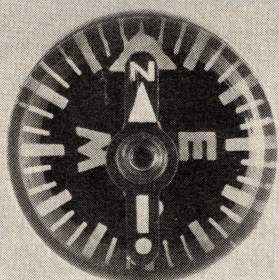
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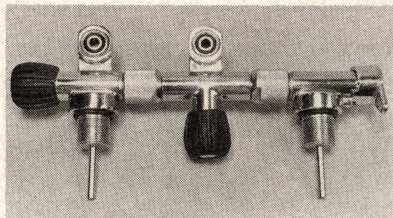


New Gear

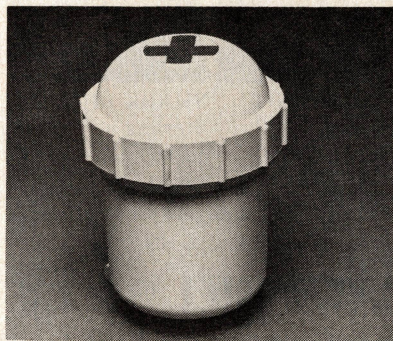
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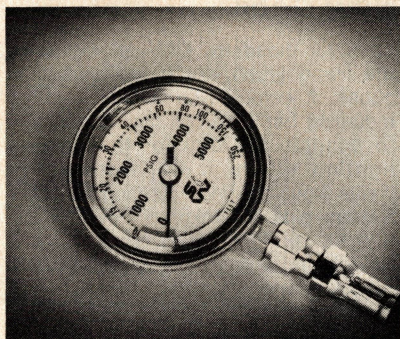


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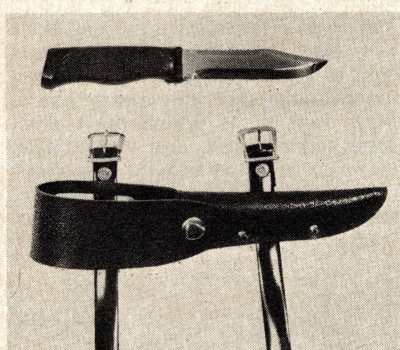




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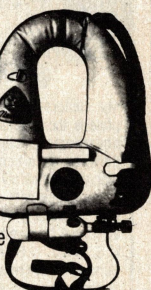
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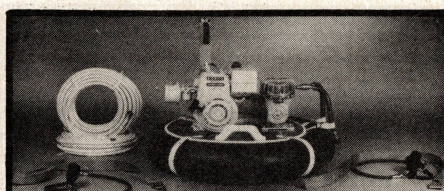
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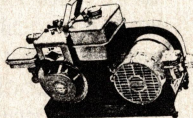
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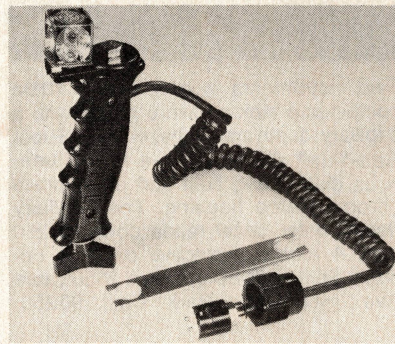
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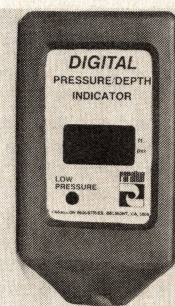
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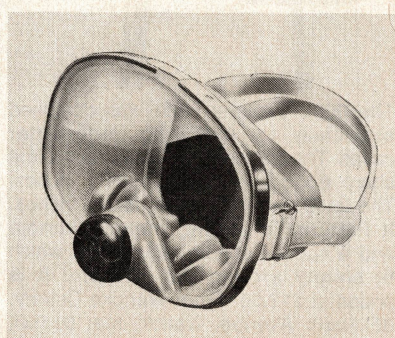
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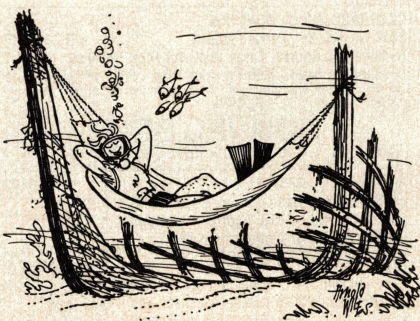
In order to better serve the dive industry and the educational needs of students, Divers Institute of Technology, Inc. has announced that it will concentrate entirely on the six-month Professional Deep Sea Diving Course which offers basic training in commercial diving as well as additional advanced training. Because of the popularity of this more comprehensive six-month course, the 14 week course which has been offered since the school first started classes in 1969, will be discontinued.



The main reasons DIT is discontinuing its 14 week course, states John Manlove, president of the school, are: "To afford the best possible training to our students and to meet the requirements of the ever-expanding growth and changing manpower needs of the dive industry."

In July of 1975, DIT expanded its curriculum to include a six-month course. The new course was designed so students would have a more comprehensive program available to them which would not only equip them with the necessary skills and talents to meet the new demands confronting the commercial diver of today, but which would also open additional doors to them in the labor market. The new program has become increasingly popular and has been accepted very well by both students and the industry. Currently, 89 percent of DIT students are enrolled in the six-month course, and all students who are enrolled in classes yet to convene, have submitted applications for the longer course.

More details about the Divers Institute Of Technology, Inc. and the training offered there may be obtained by writing to the school at 1133 N.W. 45th Street, P.O. Box 70312, Seattle, Wash. 98107.



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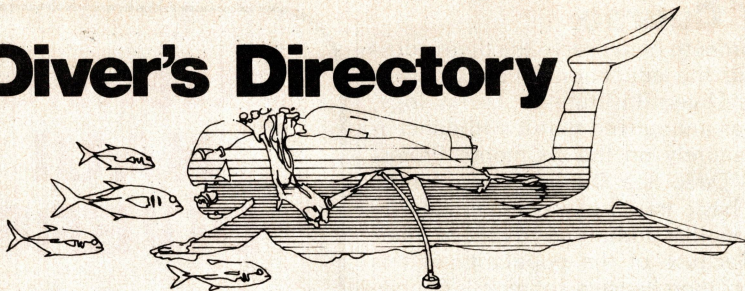
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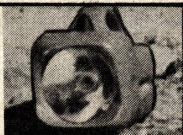
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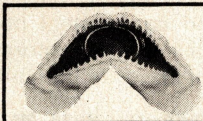
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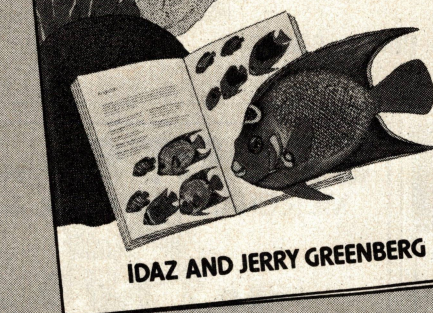
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This one-week course covers specialized equipment, exposures, artificial lighting, films, lenses, macro photography, filtration, and both the artistic and scientific applications of undersea photography. There are two dives daily using the waters around Rockport Harbor. Color film is processed following each day's dives for immediate critique. Curtsinger will make a presentation of his work with seal and whale photography and other sea mammals.

This one-week course is limited to 15 certified divers. All applicants should have a basic knowledge of photography, and must provide their own cameras. Tanks, additional dive gear, and some lighting equipment are available for rental. Cost for the course is \$225, including daily ferry service to the dive sites. There is a \$20 lab fee for color film processing.

The Maine Photographic Workshop offers a wide range of artistic, scientific, and commercial photography courses. For complete information write, MPW, Rockport, Maine 04856.

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The 16mm copy is \$115, the Super 8, \$55. To order contact: Mako Films, 100 Richmond Street East, Suite 206, Toronto, Ontario M5C 1P1.

CEDAM Convention

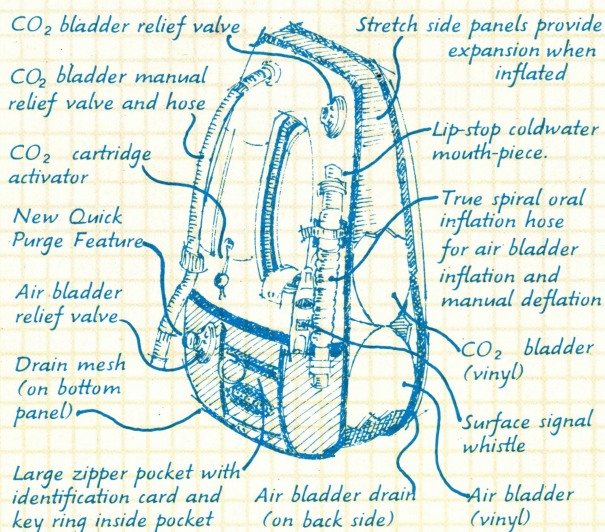
CEDAM International is having its annual meeting and convention July 5-8 at the Club Akumal Caribe, Akumal Quintana Roo, Mexico. The organization's international headquarters are there. The meeting will feature seminars, symposiums, workshops and an underwater film festival, as well as diving and jungle excursions.

Following the convention is the CEDAM expedition to Chinchorro to explore the outer reefs and relocate known shipwrecks for underwater archaeological research and to study recovery techniques. Reef and shore fishes will be collected for identification and to establish a data bank for the future ecological and conservation efforts of CEDAM.

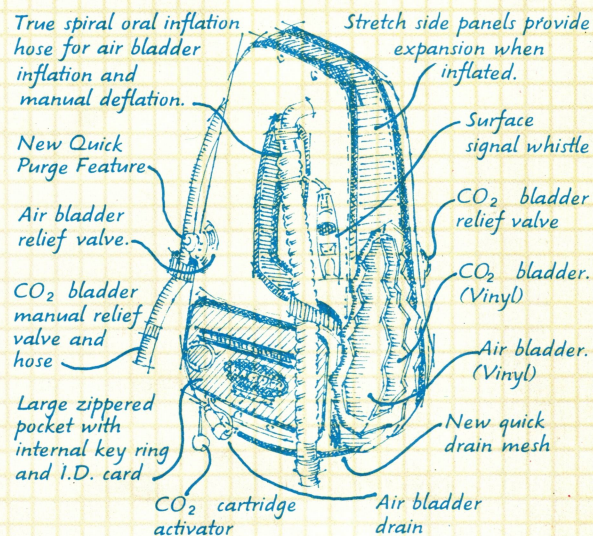
CEDAM is an acronym for Conservation, Education, Diving, Archaeology, Museums. It is a nonprofit society.

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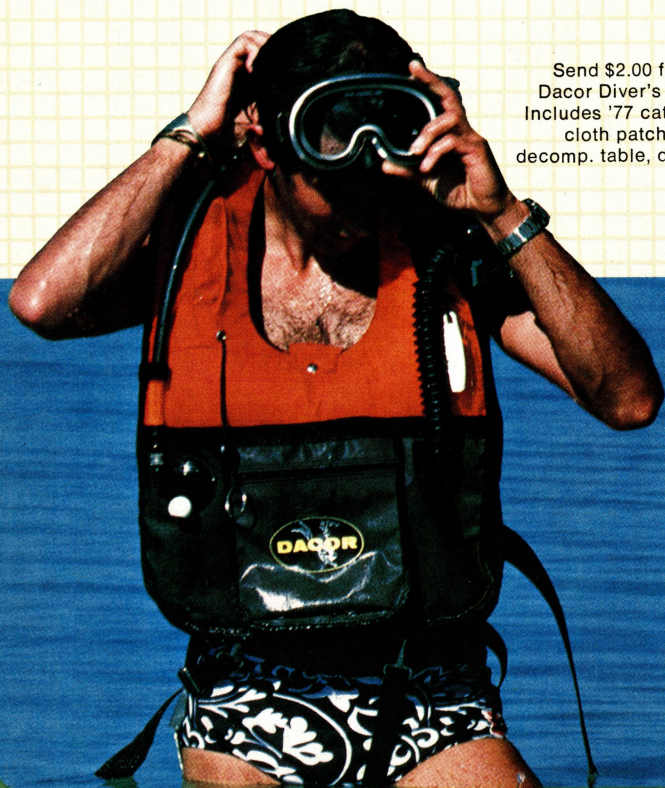
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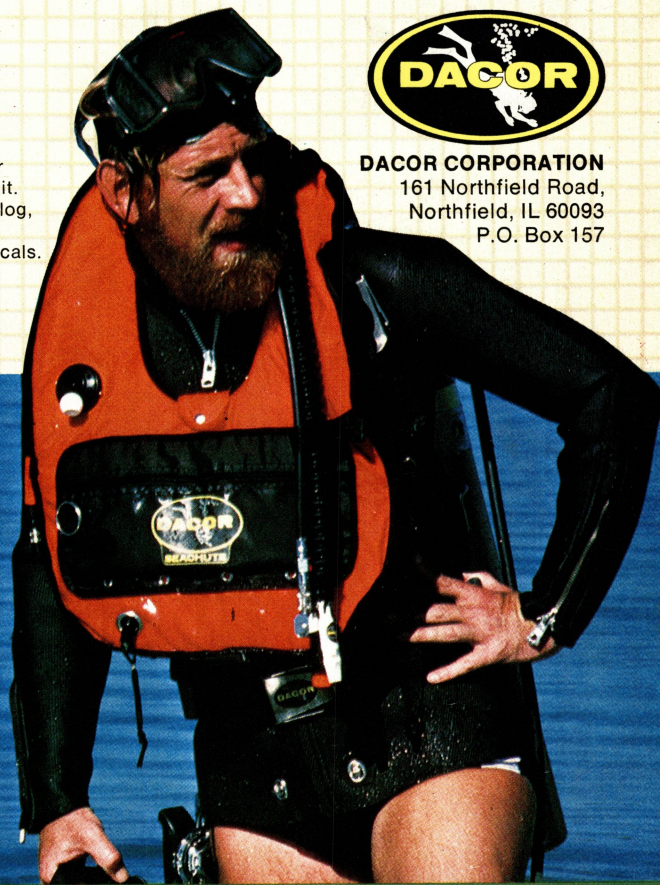
"Seachute"® Model BC4 contains two separate bladders. The top section of the vest is used for surface flotation and emergency inflation. The bottom section is the buoyancy compensator, located at the diver's center of gravity. The new leg harness assembly eliminates straps on the neck and shoulder area. Each section has 20 lbs. of buoyancy, giving the diver a total of 40 lbs. if both sections are inflated.



"Seachute"® Model BC1 gives the diver emergency back up inflation through the use of a separate CO₂ bladder. Dual bladders allow the complete separation of air and CO₂ to prevent an exchange of gases. Exclusive "Kwik" harness with collar fastened crotch and shoulder straps eliminates the waist belt. 42 lbs. of buoyancy at the surface.



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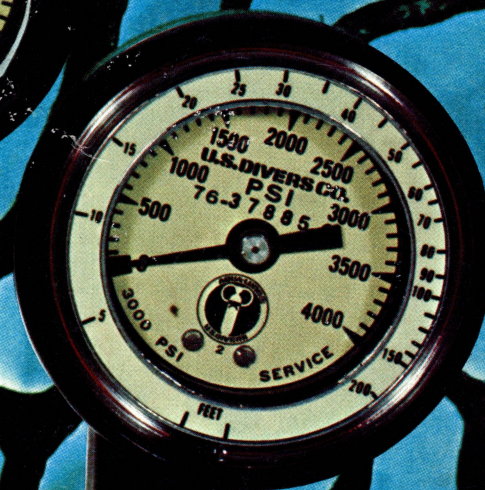
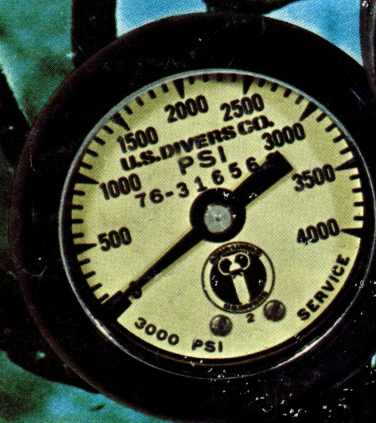
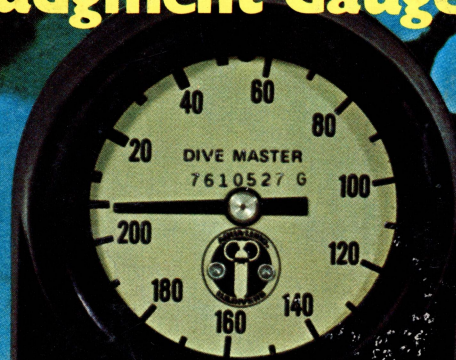
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